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THE MEDICAL JOURNAL OF AUSTRALIA

VOL. II.—14TH YEAR. SYDNEY: SATURDAY, OCTOBER 15, 1927. No. 16.

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THE HISTORY OF BLOOD TRANSFUSION.

By A. W. Holmes à Court, M.D. (Sydney), M.R.C.P. (London),
Honorary Physician, Sydney Hospital, Sydney.

The history of the transfusion of blood is amongst the most fascinating and romantic of medical records. There is probably no other therapeutic measure in the whole range of medical practice which has so waxed and waned in popularity throughout the centuries.

The idea that the blood contained the vital essence of life is almost as old as medicine itself. There is abundant evidence of the ancient belief in the use of blood as a remedy, the idea being that healthy blood should be used as a potion for the treatment of various ills.

Pliny ("Natural History," Volume IX, page 498) describes the drinking of the flowing blood of gladiators in the arena "as if out of living cups" for epilepsy. He also describes the employment of baths of human blood by the Egyptian kings as a cure for elephantiasis.

In Thomas Bartholin's famous book *"De Sanguine Vetito,"* published in Frankfort in 1673, there are to be found numerous instances of the use of blood as a remedy. He speaks of the use of the blood of cats, doves, turtles and other animals in the treatment of epilepsy and quaintly tells of a girl at Breslau, an epileptic who, after taking cats' blood, became endowed with the characteristics of a cat. Not content with climbing on the roofs of houses and imitating the manners of cats in voice, jumping, scratching and yowling, she would even sit for hours gazing into a hole in the floor!

Many of the ancient writers, including Galen who died in A.D. 201, advised the drinking of blood as a cure for various diseases, particularly epilepsy.

Celsus (*Liber* 3, *Caput* 23) deplores the custom of the people who rushed into the arena to drink the blood fresh flowing from the jugular veins of the dying victims.

Although it has been claimed that earlier authors made reference to transfusion of blood, it is now generally agreed that no authentic record exists of a deliberate attempt at transfusion until a much later period in the evolution of medicine.

The history of transfusion proper has been said to start about the year 1490, when an attempt is reputed to have been made at Rome by a Jewish physician, Abraham Meyre, to transfuse blood from three small boys into the veins of Pope Innocent VIII. The testimony in regard to this is, however, conflicting; Rafael Sabatini in his life of Cæsar Borgia states that blood was drawn from three boys who were each to receive a ducat as reward. Too much was taken and the boys died. The Pope hearing of this was horrified and the Jew fled. Raynaldus states that the blood was taken in order that the quack from this might by chemical art prepare a distillate for a draught for the Pontiff. Other authorities state that an attempt at transfusion was made and that the Pope died as well as the three boys. There is indeed no assurance that the Holy Father received either the transfusion or the drink, and much of the story is probably apocryphal. The only point about which all are agreed is that the Jew fled as quickly as possible after the failure of his experiment!

Reference to transfusion appears in the writings of Andreas Libavius, 1546-1616, a native of Saxony, who was Professor of Poetry and History at Jena in 1588. In his extensive works upon chemistry and chemical medicine there is to be found a description of transfusion which appears to antedate Harvey's discovery of the circulation in 1613.

> Let there be a young man, robust, full of spirituous blood, and also an old man, thin, emaciated, his strength exhausted, hardly able to retain his own soul. Let the performer of the operation have two silver tubes fitting into each other. Let him open the artery of the young man and put into it one of the tubes, fastening it in. Let him immediately after open the artery of the old man, and put the female tube into it and then the two tubes being joined together, the hot and spirituous blood of the man will pour into the old one as it were from a fountain of life, and all of his weakness will be dispelled.

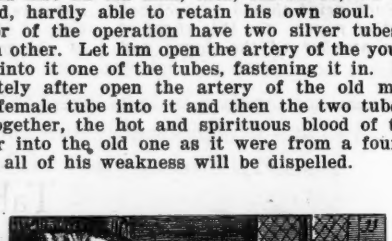


Figure I.
Showing the Transfusion of Blood of an Animal to a Man.

There is, however, no certain evidence that Libavius actually performed a transfusion, although he referred to the subject freely in his writings. Jullien in fact (*"Transfusion du sang,"* 1875) suggests that Libavius's reference to transfusion was intended to be merely ironical! It is, moreover, unlikely that any real attempt at transfusion would have occurred prior to Harvey's discovery of the circulation.

Harvey had been appointed physician to Saint Bartholomew's Hospital in 1609 and in 1616 as Lumleian lecturer had stated his theory of the circulation, but not until its publication twelve years later was his work generally known.

It is not until after the middle of the seventeenth century that the first authentic references to blood transfusion are to be found.

The credit for this is taken by Francesco Folli, a Florentine physician born in 1624, who claimed to

[1] Read at a meeting of the Section of Medical Literature and History of the New South Wales Branch of the British Medical Association on August 18, 1927.

have performed the first transfusion of blood on August 13, 1654, in the presence of the Grand Duke Frederick II.

Folli preferred to employ a silver tube inserted into the artery of the donor and a cannula of bone into the vein of the recipient, connecting the two by a hollow pipe made from a blood vessel taken from an animal (see Figure I).

About the same time, 1653, Robert de Gabets, a monk of Cluny, demonstrated the possibility of performing intravenous transfusion, using two silver tubes containing a valve and connected by a leathern ball, the size of a walnut.

Soon after this we find records of work done in England by Richard Lower who at the suggestion of Sir Christopher Wren performed direct transfusion, using a silver cannula to obtain continuity, from the artery of one animal to the vein of another. Wren had previously performed experiments in the infusion of various drugs into the veins of animals. A full account of the infusional surgery of the period is to be found in Major's book entitled *"Chirurgica Infusoria,"* published in 1664.

In Samuel Pepys's diary under date November 14, 1666, there is to be found the following reference to the work of Lower.

> Dr. Croone told me at the meeting at Gresham College tonight . . . . there was a pretty experiment of the blood of one dog let out, till he died, into the body of another on one side, while all his own run out on the other side. The first died upon the place, and the other very well, and likely to do well. This did give occasion to many pretty wishes, as of the blood of a Quaker to be let into an Archbishop, and such like; but, as Dr. Croone says, may, if it takes, be of mighty use to man's health, for the amending of bad blood by borrowing from a better body.

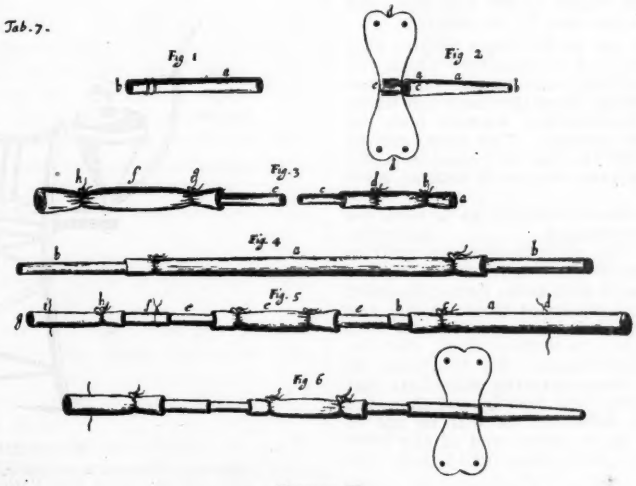


FIGURE II.
Showing Lower's Transfusion Tubes, 1666. Reproduced from "Early Medical and Biological Science," by Gunther.

The honour of the first human transfusion, however, belongs to a Frenchman, Jean Denys, doctor of medicine to the Faculty of Montpellier, who became physician in ordinary to Louis XIV. After a multitude of experiments in the transfusion of blood from animal to animal with varying results, Denys in the month of June, 1667, removed from the median basilic vein of a man three hundred cubic centimetres (ten ounces) of blood and immediately afterwards by means of a tube, connected the vein with the crural vein of a lamb and six hundred cubic centimetres (twenty ounces) of lamb's blood was poured into the patient.

Denys paid the man who straightway repaired to an inn, where he ate and drank, suffering no ill-effects.

Denys subsequently repeated the experiment, transfusing the blood of a lamb into a sick boy, aged ten, with fatal results.

In the *Philosophical Transactions*, October 21, 1667, the remarks of another French experimenter, Gaspar de Guyre are quoted. These are of considerable interest, as they contain the first warning of the dangers attending the administration of incompatible blood. De Guyre affirms: "That an expert Acquaintance of his, transfusing a great quantity of blood into several Doggs, observed always, that the Receiving Doggs pissed Blood."

Other similar cases quoted by Denys are of interest, in that these appear to be the first recorded observations of hæmolysis following the transfusion of incompatible blood.

On November 23, 1667, Lower, at Arundel House, attempted the same operation upon Mr. Arthur Coga, "a mildly melancholy insane man," using the blood of a lamb. After the operation the man stated that he felt himself better. Lower would no doubt have carried on his work and performed transfusion from man to man, had it not been that the law and local prejudice prohibited such operations.

The description of the method employed by Lower in his experiments is to be found in the records of the *Royal Society of London Philosophical Transactions*, Volume I, page 353, December 17, 1666 (see Figure II).

> The method observed in transfusing the blood of one animal into another, as was first published by Dr. Lower in Oxford, and by him communicated to the Honourable Robert Boyle, who imparted it to the Royal Society is as follows:
>
> First take up the carotidal artery of the dog or other animal whose blood is to be transfused into another of the same or a different kind, and separate it from the nerve of the eighth paire, and lay it bare above an inch.
>
> Then make a strong ligature on the upper part of the artery, not to be united again, but an inch below, *videlicet*, towards the heart. Make another ligature of a running knot, which may be loosened or fastened as there shall be occasion. Having made these two knots, draw two threads under the artery between the two ligatures, and then open the artery and put in a quill, and tie the artery upon the quill very fast by those two threads, and stop the quill with a stick. After this make bare the jugular vein in the other dog about an inch and a half long, and at each end make a ligature with a running knot, and in the space betwixt the two running knots draw under the vein two threads as in the other. Then make an incision in the

vein, and put into it two quills, one into the descendant part of the vein to receive the blood from the other dog and carry it into the heart, and the other quill put into the other part of the jugular vein which comes from the head (out of which the second dog's own blood must run into dishes).

These two quills being put in and tyed fast, stop them with a stick till there is occasion to open them.

All things being thus prepared, tie the dogs on their sides towards one another, so perfectly that the quills may go into each other (for the dogs' necks cannot be brought so near but that you must put two or three several quills more into the first two to convey the blood from one to another).

After that unstop the quill that goes down into the first dog's jugular vein and the other quill coming out of the other dog's artery, and by the help of two or three other quills put into each other according as there shall be occasion, insert them into one another. Then slip the running knots, and immediately the blood runs through the quills as through an artery, very impetuously.

And immediately as the blood runs into the dog unstop the other quill coming out of the upper part of the jugular vein (a ligature being first made about his neck, or else his other jugular vein being compressed by One's finger), and let his own blood run out at the same time into dishes (yet not constantly, but according as you perceive him able to bear it, till the other dog begins to cry and faint and fall into convulsions, and at last dye by his side).

Then take out both quills out of the dog's jugular vein and tye the running knot fast and cut asunder (which you may do without harm to the dog, one jugular vein being sufficient to convey all the blood from the head and upper part by reason of a large anastomosis, whereby both the jugular veins meet about the larynx). This done, sew up the skin and dismiss him and the dog will leap from the table and shake himself and run away as if nothing ailed him.

There are many circumstances necessary to be observed in the performing of this experiment . . . . Secondly, that you constantly observe the pulse beyond the quill in the dog's jugular vein which it acquires from the impulse of the arterious blood). For if that fails, then 'tis a sign that the quill is stopt by some congealed blood, so that you must draw out the arterial quill from the others, and with a probe open the passage again in both of them, that the blood may have its free course again. For this must be expected when the dog that bleeds into the other hath lost much blood, his heart will beat very faintly, and then, the impulse of the blood being weakened, it will be apt to congeal the sooner, so that at the latter end of the work you must draw out the quill often and clear the passage . . . .

The most probable use of this experiment may be conjectured to be that one animal may live with the blood of another, and consequently that those animals that want blood or have corrupt blood may be supplied from others with a sufficient quantity, and of such as is good, provided the transfusion be often repeated, by reason of the quick expense that is made of the blood.

Meanwhile in Paris Denys continued his work until arrested and brought before a court accused of murder of one of his transfused patients; he proved his innocence and the court acquitted him, but prohibited further experiments with human beings, except with the consent of the Faculty of the University and then they were only to be done by a registered physician of that city.

Many accidents and deaths followed similar experiments and divided the opinions of the Faculties of the various countries of Europe and we find that in France transfusion was prohibited by an edict of the Parisian Parliament.

Further progress in transfusional surgery was brought to a standstill in almost all parts of Europe by a special edict of the Pope at Rome about the year 1678.

The whole matter then fell into oblivion and desuetude and almost a century and a half elapsed before interest was again awakened in the question.

There are, however, to be found isolated references to the subject in medical writings towards the end of the eighteenth century. In 1792 at Eye in Suffolk a Dr. Russell transfused the blood of two lambs into a boy suffering from hydrophobia and the recovery of the patient was attributed to the treatment.

In 1796 Erasmus Darwin recommended transfusion for putrid fever, cancer of the œsophagus and in other cases of malnutrition. He suggested that blood should be transfused through goose quills, connected by a short length of chickens' gut. There is no record of his actual performance of the operation.

Interest in the subject was next revised in England by James Blundell, lecturer in physiology and midwifery at Saint Thomas's and Guy's hospitals.

Figure III.
Showing Blundell's Impellor. From "Researches Physiological and Pathological," 1824.

In 1818 he published a paper on experimental transfusion, performed by means of a special apparatus devised by himself and known as Blundell's impellor (see Figure III).

Blundell's apparatus as described in his paper consisted of a funnel shaped receptacle for the blood with a syringe incorporated in the funnel containing a complicated system of spring valves which caused the blood to be forced along the delivery tube when the piston was pushed down. The impellor was fixed to the back of a chair to give it stability.

In Blundell's "Obstetric Medicine," published about 1820 and dedicated to the Duke of Wellington in commemoration of his military achievements, there are to be found detailed descriptions of the author's numerous experiments in animal transfusions performed upon dogs.

Blundell also transfused patients with human blood, and although his results were not by any

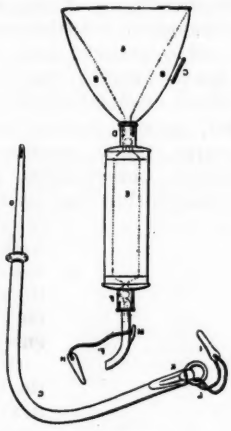


FIGURE IV.
Showing Higginson's Transfusion Instrument. Reproduced from "Blood Transfusion," Keynes, 1922.

means uniformly successful, he stated his "own persuasion to be that transfusion by the syringe is a feasible and useful operation, and that after undergoing the usual ordeal of neglect, opposition and ridicule, it will hereafter be admitted into general practice. Whether mankind are to receive the first benefit of it in this or any future age from British surgery or that of foreign countries, time, the discoverer of truth and falsehood, must determine."

This work marks the real starting point of the clinical application of transfusion in the nineteenth century.

The chief difficulty in the performance of the operation was, of course, the coagulation of the blood.

Bischoff in 1835 endeavoured to overcome this by the use of defibrinated blood.

It is recorded that Sir Thomas Smith in 1873 employed defibrinated blood for transfusion in a case of *melæna neonatorum* at Saint Bartholomew's Hospital.

The apparatus used consisted of

a wire egg beater, a hair sieve, a three ounce glass aspirator syringe, a fine, blunt ended aspirator cannula, a short piece of india rubber tubing with a brass nozzle at either

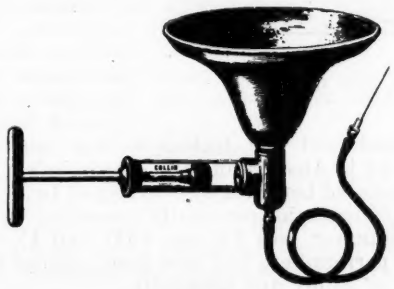


FIGURE V.
Showing Collin's Apparatus, 1875, from *"Transfusion du sang,"* Jullien, 1875.

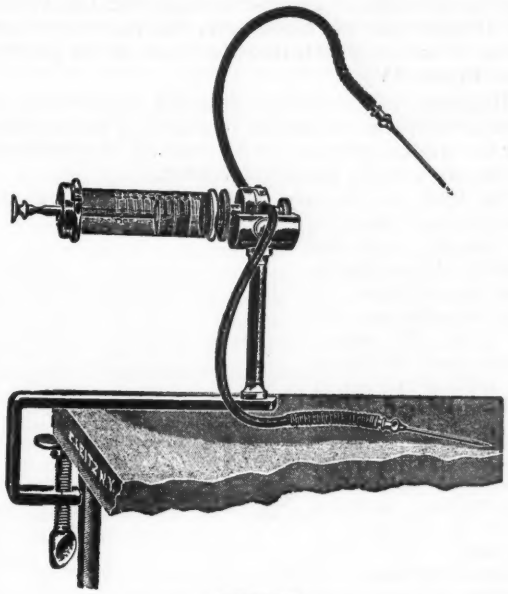
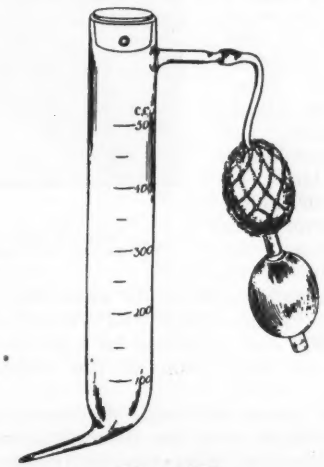


FIGURE VI.
Showing Feinblatt's Apparatus, from "Transfusion of Blood," Feinblatt, 1926.

end, connecting the syringe with the cannula, a tall, narrow vessel standing in warm water for defibrinating the blood and a suitable vessel floating in warm water to contain the defibrinated blood.

During this period many Continental workers published records of successful transfusions and in 1859 Martin, of Berlin, had collected records of fifty-seven cases in forty-three of which the operation had been successful. Fatalities had also been reported which were then considered to have been due to the introduction of air into the veins, but were probably caused by the use of incompatible blood.

In 1857 Higginson in England introduced an important modification into the technique by apply-



FIIGURE VII.
Showing the Kimpton-Brown Tube, 1913.

ing the principle of a rubber syringe with ball valves for transferring the blood from the receptacle into which it was received, into the veins of the patient (see Figure IV).

Higginson's syringe has achieved immortality in another direction, although it was used successfully for its original purpose by its inventor in a series of seven cases which he duly recorded.

In 1873 an inquiry was carried out by the Obstetrical Society of London, into the merits of transfusion and the evidence to date was summarized in 1874. The apparatus used by Collin in 1875 is typical of this period (see Figure V).

The results were on the whole discouraging, particularly as the blood of animals was still frequently used.

The patients were usually *in extremis* before the operation was attempted and from the æsthetic standpoint there were obvious objections to bringing animals into the sick room.

During the next thirty years the operation again fell into disrepute, until interest was once more revived early in the present century by the advances in blood vessel surgery following the work of Murphy in 1897 and that of Carrel and Guthrie later. Finally Crile placed the technique of direct transfusion on a firmer basis by devising a method of uniting artery to vein without the intervention of a cannula. Crile's experiments were fully described in his book "Hæmorrhage and Transfusion," published in 1909 and furnished to a great degree the basis for the delineation of the indications for transfusion.

The most important single discovery relating to blood transfusion was the demonstration in 1900 by Landsteiner and independently in the same year by Shattock of the presence of iso-agglutinins and iso-agglutinable substances in human blood. These investigations furnished a satisfactory explanation of the severe and sometimes fatal reactions which had so often been observed, and at once put the admixture of blood on a satisfactory basis.

Jansky in 1907 showed that all human blood falls within four groups. Moss, working independently, confirmed Jansky's observations and contributed the important observation that iso-hæmolysis of red cells never occurs without their previous agglutination, although agglutination may occur independently of hæmolysis.

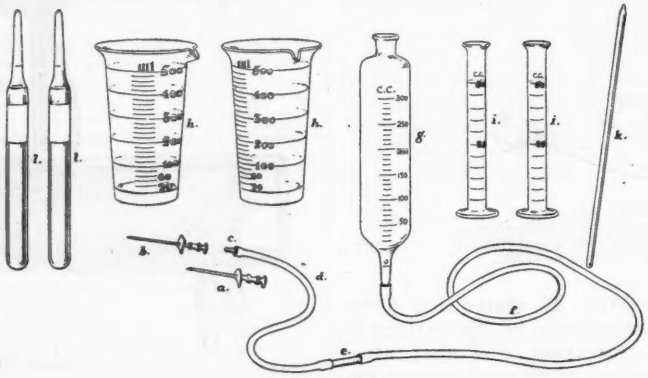


Figure VIII.
Showing Lewisohn's Apparatus. (By courtesy of Dr. P. Fiaschi.)

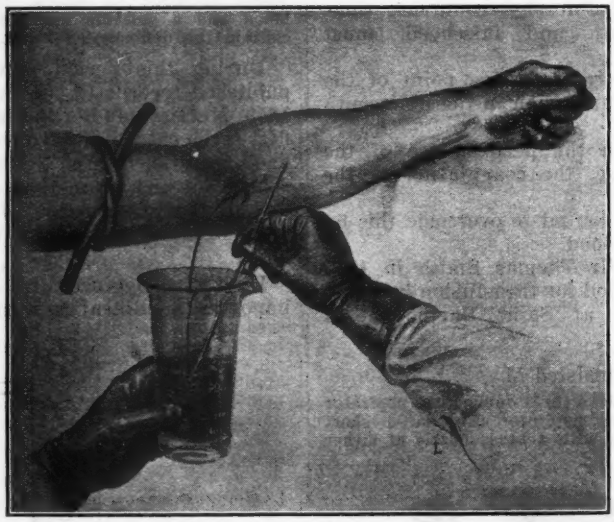


Figure IX.
Showing Lewisohn's Apparatus in Use, from Lewisohn's Original Photograph. (By courtesy of Dr. P. Fiaschi.)

Simplification of the technique was the next advance and numerous syringe methods were devised and employed with more or less satisfactory results. Feinblatt's apparatus figured in his book "Transfusion of Blood," 1926, is shown as a modern evolution of the earlier syringe methods (see Figure VI).

The use of a glass cylinder, smoothly coated with paraffin wax was introduced by Kimpton and Brown in 1913 (see Figure VII).

A further epoch making advance was next made by the introduction of sodium citrate as an anticoagulant by Hustin in Belgium in 1913, thus making indirect transfusion a feasible operation.

Professor Agote, of Buenos Ayres, in November, 1914, is credited with having performed the first transfusion in which citrated blood alone was used and the technique was perfected by Lewisohn in America in 1915. Lewisohn's apparatus is reproduced herewith by courtesy of Dr. P. Fiaschi from photographs personally presented to him by the originator (see Figures VIII and IX).

The performance had now been reduced to a procedure of safety and simplicity.

Meanwhile events had moved rapidly in Europe and the exigencies of the Great War provided the

necessary stimulus for the universal application of transfusion in traumatic hæmorrhage.

It was not, however, until 1917 with the advent of American medical officers to the medical units in France, that knowledge of blood transfusion became widespread and universal.

The paraffined tube method of Kimpton and Brown became widely used and the modification of the citrate method devised by Captain Oswald Robertson was soon applied to medical units in the field (see Figure X).

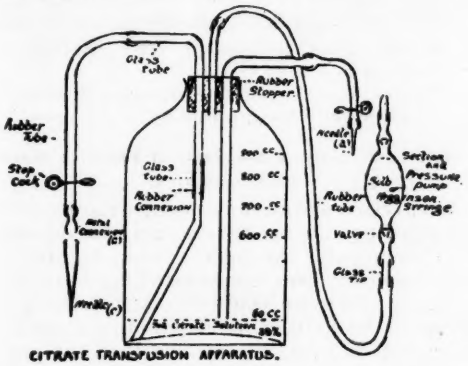


FIGURE X.
Showing Robertson's Bottle, Great War Period, 1917.

The Australian Army Medical Corps played a prominent part in adapting these methods in field ambulances and units in the forward area.

The post war history of transfusion is well known to all and after many vicissitudes this most valuable therapeutic measure has at last achieved a permanent place in medicine and surgery.

Acknowledgment.

In conclusion I wish to express my appreciative thanks to my colleagues, Dr. L. Cowlishaw, Dr. Stewart McKay and Dr. P. Fiaschi, whose assistance has enabled me to compile this brief record of what is perhaps one of the most amazing chapters in the history of medicine.

SOME PRINCIPLES UNDERLYING THE FUNCTION AND EFFECTIVE ACTION OF MUSCLES: THEIR EXPLANATION AND ILLUSTRATION, WITH PARTICULAR REFERENCE TO WAR INJURIES.[1]

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Foreword.

With the outbreak of the late war the activities of many were diverted to channels into which they had little intended to venture, and these unexplored channels often led to uncharted oceans of difficulty. When in 1916 and 1917 transports were returning in rapid succession, laden with wounded men suffering from every conceivable form of injury, it was a distracting time for those responsible for their care. In many cases it had to be realized that the damage was done and that no form of treatment could replace in any degree the gross destruction of tissue that had occurred.

In the majority of instances, however, after the obvious surgery had been done, there remained an aftermath of long and tedious treatment in the physio-therapy departments. Injuries to bone, joint, muscle, nerve and vessel abounded, together with every imaginable combination and complication of such injuries and with functional disability often added to the organic changes. What could be expected of such physical treatment? For how long a time should it be continued? On what principles was the work to be carried out? Should a good working knowledge of anatomy and of muscle function be directed boldly to the problems as they presented themselves and strange apparatus confidently applied, although without precedent and at times peculiar or bizarre?

There was no experienced head to answer these questions or to advise, for a similar position had not been met in the world before. The senior surgeons of the community, left at home, were so heavily engaged with the direct work of civil and military practice, that they had little time for such problems.

In this dilemma the thoughts turned towards three Melbourne men who had done helpful work bearing on these questions years before war broke out. These men were Mr. Peter Bennie, Mr. Colin MacKenzie and Mr. Basil Kilvington. Mr. Bennie had applied a mastery of mathematics and physical science to the solution of difficult orthopædic problems in his long and distinguished career at the Melbourne Hospital for Sick Children.[(1)] Mr. MacKenzie had emphasized that a recovering muscle must recommence work with a minimum load[(2)] and had preached most persistently Hilton's doctrine of rest to injured parts.[(3)] Mr. Kilvington's original work on the transplantation of nerves had been published very early in the century[(4)]; Professor Osborne had dwelt impressively upon it in a lecture to medical students in 1905 and it had been quoted abroad freely long before the war. But no one of these found a place in the scheme of things at the time.

As the war dragged on and the necessity for treating great numbers of destructive injuries continued, it was natural for the attention greatly to be drawn to the muscles and to their actions and characteristics. At first the cases seemed to form but a hopeless tangle of confused anatomy. However, experience hardened as a result of studying the beautiful manifestations of muscles in action in such a widespread display and over so long a period (there was seven years' association with this work—1916 to 1923) and of comparing them with the halting action of injured parts. It then was recognized that, while many cases fell into groups and others remained individual, most of the deformities were associated with simple phenomena

[1] This paper is based on work carried out when the author was surgical registrar of the Fifth Australian General Hospital.

that I shall venture for the purpose of this paper to term principles.

Introduction.

Muscles are the active agents of movements in which the bones are the passive levers and the nerves the passive conductors of activating impulses. Although the voluntary muscles in action present such an impressive and obvious demonstration of their power and exhibit so striking an illustration of their energy in the production of movement, it must be remembered that in health they in themselves possess no power of spontaneous function, being, as far as voluntary movement is concerned, but the harnessed servants of the will, dependent for their action on connexion with the central nervous system. Once that connexion is severed, they become, as far as the production of voluntary movement is concerned, but inert masses of functionless tissue. While with all their central connexions intact they display such a picture of harmonious function and appear to act so independently and freely, no horse between the shafts, no workman at his bench, no soldier in the ranks, has the limits to his activity so rigidly circumscribed. There is no presiding intelligence in the muscle itself.

As far as the production of movement is concerned, the primitive function of a muscle merely is to contract; in a skeletal muscle by reducing its length the sites of origin and insertion are approximated and movement of some part of the body is effected. What the actual nature of that movement may be, depends on the mechanical construction of the joint or joints on which the muscle acts. Should those joint surfaces be altered, the muscle cannot modify its function or the nature of its contraction in order to rectify an abnormal movement produced by the joint change. In the case of several muscles acting together on a joint to produce a given movement, should some be paralysed, the others cannot accommodate themselves to the new condition. All that the muscles can do in either of these cases is to modify the strength of their contraction. For instance, in cases of paralysis of the hamstring muscles it will be found that very good flexion of the knee joint is obtained by the *gracilis*, but that the movement is accompanied by a little internal rotation of the tibia on the femur. No method of muscle exercise can overcome this. The abnormal movement is determined by the nature of the joint surfaces acted upon and the sites of origin and of insertion of the muscles concerned. An interesting point may arise here following the treatment by suture of the sciatic nerve in cases of its division high up with complete paralysis of the hamstring group. In reviewing these cases, it is not uncommon to receive a report from the masseur at an early date to the effect that the *biceps* and *semitendinosus* have recovered voluntary function, but to find on examination that the *gracilis* has been mistaken for the *semitendinosus* and that the internal rotation of the tibia on the femur has resulted in a tightening up of the slack paralysed tendon of the *biceps* muscle, so that it comes to lie taut and palpable beneath the finger and often visible beneath the skin, providing a very interesting fallacy to be on guard against in reviewing these cases and estimating the degree of recovery that has occurred from time to time.

To take a more simple case. Where as a result of infantile paralysis a given group of muscles is weak, its opponents do not intelligently relax in order to restore equilibrium. On the contrary, contracture is liable to occur in them, creating a fixed deformity.

Principles.

Of the principles referred to previously, those that will be considered just now are as follows:

1. Stability is the basis of effective movement.
2. Maximum muscle contraction is exerted to produce fixation.
3. The reciprocal action of an antagonistic muscle cannot voluntarily be suppressed or reversed.

Principle I: Stability is the Basis of Effective Movement.

Its Explanation.

For effective movement to occur, the part that is to be acted upon, must have a firm base on which to move. Similarly, the agent producing the movement must have firm attachments made to unyielding parts, otherwise confusion will occur and the movements be halting, irregular and uncontrolled. In accordance with this we see that the joints of the body are constructed in various ways and that stability depends on different factors. In some, where great strains are borne and the movements are simple, more or less well-formed sockets are present, as in the elbow, hip and ankle. Elsewhere fibrous tissue structures appear to be greatly depended upon, as in the capsule and the cruciate ligaments of the knee joint. In other parts again the outstanding phenomenon is the reliance that is placed on muscles alone, which structures are closely associated with the joint concerned almost in their entire length, as in the shoulder. But when the joints and the movements about them come to be closely studied and particularly when parts that are sound, come to be compared in their movements with parts that are injured or deformed, and joints examined, the range and nature of which are not rigidly determined by bony conformation, it is realized how supreme is the importance of muscle amongst the soft tissues in maintaining stability. Such structures as the cruciate ligaments of the knee that impress us so much in textbook descriptions, appear to be guiders helping to direct the movements of the knee rather than directly to insure its stability. They are composed of a low type of tissue of poor vitality. If the hamstrings be paralysed, they cannot prevent the hyperextension that occurs; nor can they retain the condyles of the femur in their normal position on the head of the tibia in paralysis of the *quadriceps femoris*.

So much for the stability of the fulcrum; but the power represented by the muscle must have unyielding points of application which are represented by its origin and insertion. That is to say, there must be stability for the application of muscle power also.

It is to be noted that, for stability to be insured, the base on which movement is carried out and which provides the fulcrum, need not be fixed. The

fingers and wrist may be moved, while the elbow is flexing or extending and at the same time the humerus may be passing through such a movement as abduction. As these movements occur, the scapula itself may be rotated in apposition with the thorax, maintaining a rigid platform for the whole upper limb as the body itself in its turn is carried forwards in progression. This of course is in accordance with what happens in any other locomotive engine, individual movements of its parts being preserved, provided that there is present an underlying stability.

In the case of muscles the attachments need not be to bone, for example the *accessorius* has a bone attachment at but one extremity and the *lumbricales* have no bone attachments at all.

While in the simplest cases stability is assured by the presence of a bony base and needs little explanation and the help of muscle energy does not appear, on the surface at least, to be of outstanding importance, we get other instances in the body in which the support of muscles is more obviously called in, and we ultimately pass in our survey to more subtle forms depending on delicate functions of coordination and making a rather complicated picture in the interplay of muscles, involving the most delicate perception of muscle sense.

Its Illustration.

The ways in which stability is obtained in normal parts, have been suggested in the foregoing section. It would be more interesting here to consider how stability is obtained in cases of injury where the agents at work previously have been destroyed or thrown out of action.

Where the bony parts have been destroyed, the condition most often met during the war period was excision of the elbow; the want of stability was obvious, so much so that comment is hardly called for. In these cases the nerve supply is not interfered with, the muscles being intact in that respect; but for the two reasons already explained they cannot effectively carry out their function. In the first place there is instability of the ulna and radius since no purchase can be obtained against the humerus and in the second place the *biceps* and *brachialis* and *triceps* have no firm insertion into the radius and ulna; nor has the pronator-flexor group an origin from the lower end of the humerus which has been shot away or removed by surgical means.

Cases of injury to the fibrous tissues of a joint, of a nature that would destroy stability by injuring such tissues as the capsule without causing complicating injuries to bone and muscle or tendon, were so rare as to form no well defined group.

Where stability was threatened by a defect in the control of muscle, there may be mentioned in the first place a group of cases practically limited to the knee joint and usually associated with a history of injury that was not in itself very severe, perhaps a strain with a history of hydrops of moderate degree pursuing an average course to recovery or involving an operation for removal of cartilage. For long afterwards the *quadriceps femoris* would tend to relax without warning and throw the man down heavily, thus recalling the old schoolboy trick of striking the tendon of the biceps muscle of the thigh when the victim was not on guard; indeed in those terms the condition was always described by the Australian Imperial Force men concerned. Apparently as a result of the injury there is a hypersensitiveness of the nerve endings in the joint; reflexes are originated by causes that are not perceived by the individual and that would not so operate in a normal articulation. As a result there occurs a sudden relaxation of the *quadriceps*. This phenomenon never was met following an injury to the hamstrings themselves, although in the cat the motor nerves to that group of muscles contain about 30% of sensory fibres.[5]

The commonest cause of instability, however, was in connexion with the various types of paralysis. Those concerning locomotion may be briefly referred to, illustrating as they do one variety of limp.[6] In limping we are not concerned of course with one stride being shorter than the other. If that occurred, one limb would in the course of a few strides walk away from its fellow and locomotion very speedily come to an end. The word "halt" indicates what happens in a limp—the subject pauses on the sound leg in order that the affected limb may swing forward gingerly to take the weight which is borne by it but momentarily, the sound limb swinging forward rapidly in its stride in order that the affected limb may bear the weight for as brief a period as possible. This difference in the time taken to perform the respective strides implies an asymmetry of gait and this disharmony in locomotion we term limping. We may turn therefore to some instances of limping and observe how in cases of paralysis of certain muscles stability is maintained. Perhaps the commonest met with in war injuries were paralysis of the *quadriceps femoris* and of the muscles of the anterior tibial group.

In considering the stability of the knee joint the *quadriceps* is a muscle of great interest and calls for close attention. Its perfect function marks the summit of man's physical development; its impairment threatens to degrade him to the attitude of the ape. How he escapes that degradation will now be dwelt upon.

In persons with a sound *quadriceps* during locomotion, as the advanced leg takes the weight of the body (see Figure I) and hinges forwards on the *astragalus* and the knee passes from flexion to extension, the contraction of this muscle is easily demonstrated. The strain on it is greatest just before complete extension of the knee, but it is relieved altogether with continuation of the movement, as the centre of gravity passes forwards. It very often happens on account of its weakness or of its complete paralysis that extension of the knee is limited to a greater or lesser extent or is impossible in the slightest degree. This disability is overcome by manœuvring the joint into a position of hyperextension and then making use of the force of gravitation. By effecting this movement (see Figure II) the line of gravitation is made to fall well in front of the line of the joint and stability is thus secured. In

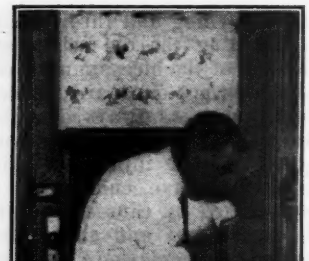

FIGURE I.
The left (sound) limb is advanced.

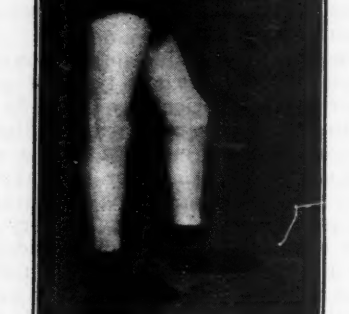

FIGURE II.
The right lower limb is advanced in a case of paralysis of the right *quadriceps*: hyperextension of the right knee is not at a maximum as the weight of the body has not been transferred entirely from the sound limb. Note the extreme wasting of the *quadriceps*, the patella standing out in profile.

well marked cases of great weakness or of absolute paralysis the injured limb is swung forwards and its foot strikes the ground in the extended position (see Figure II). The strain on the anterior tibial muscles with knee extended is too great for effective dorsiflexion to be produced, that is for the leg to be drawn forwards on the *astragalus* and progression is continued almost entirely by the momentum imparted to the body as the foot corresponding to the sound leg pushes off from the ground. As the unsound (advanced) leg takes the weight of the body (see Figure II) hyperextension occurs with a jerk. The amount of hyperextension and the severity of the jerk constitute an index to the degree of weakness of the *quadriceps*. When the weakness is slight the jerk is momentary and occurs as extension is almost complete, the *quadriceps* being strong enough to effect almost complete extension; consequently gravity is called upon only towards the end of the movement and the hyperextension is not extreme. This latter slight jerk in the gait may be wrongly interpreted and regarded as of the nature of a habit spasm, but it will readily be understood if such cases be observed carefully. On examination in the supine position it will be found that the knee cannot be extended completely.

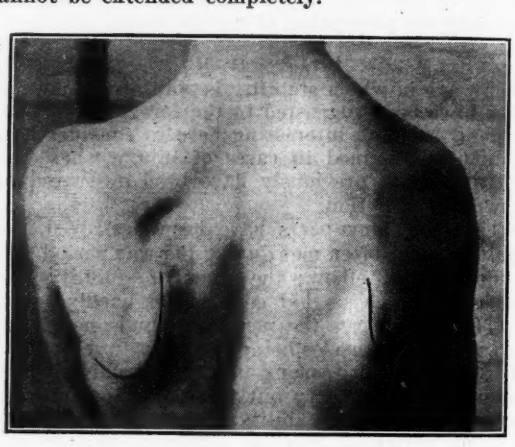

FIGURE III.
Injury to the left *rhomboideus major* is present. Note the depression of the left scapula.

Coming to the upper limb, reference may be made to cases where on the one hand large muscles and on the other hand much smaller ones are at fault. Consider in the first place the musculature supporting the scapula; the coordination is so delicate that an injury of any one of the muscles concerned will interfere severely with the exhibition of complete function of the whole group. Such a thing as one muscle taking over the function of another, seems hardly to exist; perhaps it is but one of the incorrect statements so commonly made in medicine. It may safely be said that no muscle can be destroyed or weakened without a corresponding defect being obvious when attempts are made to function. Apparently there is no surplus, each unit having its definite task and when that unit disappears function

is adversely affected to a degree in keeping with the importance of the unit concerned.

In correspondence with the foregoing we see that, when one of the rhomboids is injured (see Figure III), not necessarily paralysed and when no question arises as to the nerve supply being affected at a higher level and no complicating injury is present such as adhesions in the shoulder joint as a result of that injury to the rhomboids, the position of the scapula is altered (see Figure III) and the arm cannot be raised to full elevation. That is, the scapula cannot be rotated to its full extent with the arm abducted at the shoulder. This latter is the more remarkable when it is recalled that the rhomboids are not rotators of the scapula, but merely controllers of its vertebral border and it causes us to pause and to reflect on the significance of paralysis and on the far reaching effect of an impaired muscle —an effect that extends far beyond its function as a unit capable of producing a given movement.

To pass to a more extreme degree of involvement of the muscles of the scapular region, the case represented by Figures IV and V is interesting. Although the condition was first noted during service abroad, it cannot be regarded as a war injury, being an extreme instance of muscular dystrophy. The scapula with dependent arm takes a position determined by gravity, any muscles that may have escaped paralysis being quite incapable of withstanding the weight of the limb. Figure IV shows

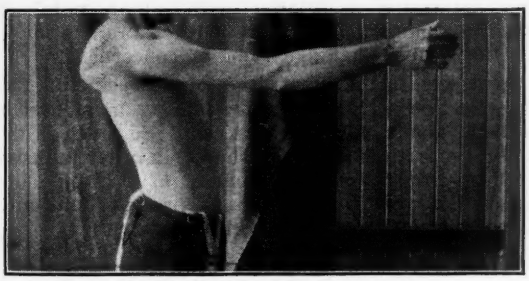

FIGURE IV.
There is extreme degree of "winging" of the scapula when abduction of the arm is attempted.

that, although the muscles controlling the shoulder joint exhibit no wasting, the arm cannot be abducted until the scapula has taken a position at right angles to what is normal. If, however, the scapula be supported, as shown in Figure V, almost complete abduction may be carried out and the elevation of the arm not seriously restricted. In this figure is seen the great muscular effort that is needed to support the scapula. It illustrates the tremendous call that is made on the thoraco-scapular muscles, not only in order to hold the scapula rigidly while the arm is carried to abduction, but beyond that to maintain this rigidity of the platform during the rotation of the scapula itself in order that the arm may be carried to full elevation.

From these great muscles with their powerful but accurately adjusted function we may turn to consider some of the smallest in the body, those of

FIGURE V.
Elevation of the arm is accomplished when the scapula is artificially fixed to such an extent that it cannot leave the thoracic wall. The photograph does not illustrate the complete elevation obtained, that is, to the vertical position.

the hand with their delicate relationship. The manifestations of ulnar paralysis are perhaps the best known. As a result of the paralysis of the lumbrical muscles the balance of the joint is upset and when it is at rest hyperextension of the two medial (or inner) fingers occurs at the metacarpo-phalangeal articulations (see Figure VI). How can that hyper-

FIGURE VI.
This shows characteristic wasting and deformity in a case of ulnar paralysis; the hand is at rest.

extension be overcome? The powerful extensors cannot overcome it, however great may be the efforts of so-called reeducation. They cannot overcome it because, powerful as they are, they do not act directly on the joint and because they function at poor mechanical advantage. The slender little lumbricals have this great power on account of the mechanical advantage with which they act. It must be remembered, however, that in ulnar paralysis not only are those fragile little muscles paralysed, but the base from which they act, has been rendered insecure by the same paralysis, because the tendons which give them their origin—the two inner (or medial) deep flexors—lie slack. The deformity of the third or ring finger is less pronounced, because the corresponding lumbrical obtains its origin partly from the deep flexor tendon of the middle finger, which latter corresponds to a part of the *flexor profundis digitorum* that is not paralysed, being supplied by the median nerve. We recognize therefore that as a result of the paralysis of the lumbricals concerned the stability of the metacarpo-phalangeal joints has been impaired and that such stability has been further affected because the paralysed muscles cannot act even as simple slings, since their own essential stability has been lessened by the slackness of the corresponding deep tendons.

If an attempt be made to extend the affected fingers, the proximal phalanges assume a more extreme position of hyperextension and the distal phalanges remain flexed (see Figure VIIA).

But if the metacarpo-phalangeal joints be fixed by a loop of strapping (see Figure VIIB) or by an appropriate grip (see Figure VIII) the fingers may be extended without the production of deformity.

The disability is now understood. The two distal phalanges cannot be extended because the proximal phalanx is unstable; there being no secure base, effective movement cannot occur. Therefore, should any measure be contemplated in order to eliminate the deformity associated with ulnar paralysis, attention must be directed to the stabilization of the metacarpo-phalangeal joints concerned.

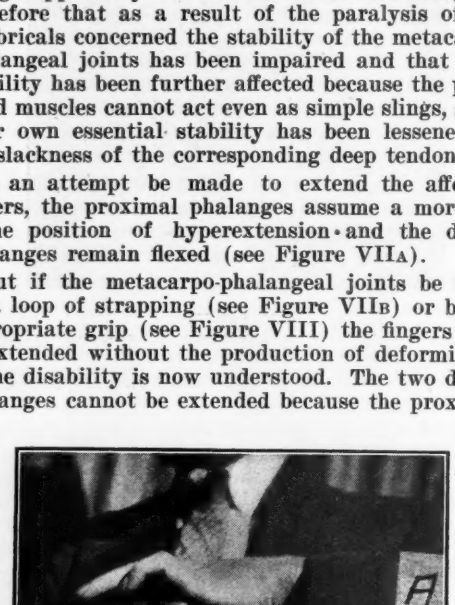

Figure VII.

A demonstrates increased hyperextension of the proximal phalanges of the ring and little fingers, produced by attempted extension at the interphalangeal joints.
B shows hyperextension prevented in the same person by a loop of strapping passing across the dorsum of the proximal segment of the ring and little fingers and around their sides and thence proximally to be attached to the skin of the palm.

Figure VIII.

This figure illustrates fixation, by an appropriate grip, of the metacarpo-phalangeal joints of the affected fingers which allows of extension occurring at the interphalangeal joints.
A shows this fixation in a sound hand.
B shows it in a hand affected by ulnar paralysis.

It is seen in the illustration of this principle that for effective action to occur stability must first be brought about, whatever the cost. So much is this so that in each of the cases shown, in order to insure stability for the accomplishment of a given movement, the accentuation of a present deformity, already pronounced, has been necessary.

Principle II: Maximum Muscle Contraction is Exerted to Produce Fixation.

Its Explanation.

Ordinary movements do not call for a great expenditure of muscle energy; for instance, to move a limb which is hanging free, such as to swing an arm or leg or move any part or the whole of a member. Even when the part is moved against gravity, although a much greater output of energy is usually called for, it is very far from the maximum expenditure possible for the muscle or group of muscles concerned, because all that is needed is sufficient energy to raise the weight of the particular limb or part. This is on account of the perfect mechanism of the healthy joints, the delicate adjustment of parts and the wonderful coordination of parallel and opposing groups of muscles.

More energy, of course, is expended when rapid movement is called for or in the use and control of momentum or when resistance is encountered, whether that resistance be influenced by the action of gravity, as in weight lifting or more obviously

and directly applied and purposefully exerted, as in combats involving great strength and power of endurance.

If a man of average size and moderate physique lie on his side with the under lower limb in a corresponding position and all muscles be relaxed and friction as far as possible eliminated, the force required to flex the leg on the knee from the extended position to that of a right angle with the thigh, corresponds to a weight of 0·78 kilogram (one and three-quarter pounds) measured by a spring balance. But if the subject now lie prone, that is on his face, it requires a force corresponding to a weight of 2·25 kilograms (five pounds) to raise the leg to a corresponding position. While if the limb be returned to the first position in order to eliminate gravity and friction be reduced to a negligible quantity and the leg then be flexed voluntarily against a resistance represented by the same spring balance, it will be seen that a force representing a weight of 7·2 kilograms (sixteen pounds) may be developed by the hamstrings in order to carry the leg through the same range of movement; that is, the muscles are capable of resisting a force of 7·2 kilograms or in other words of exerting the force of 7·2 kilograms weight.[1]

So three degrees of power have been demonstrated in connexion with the movement of the knee joint. How much greater then must be the expenditure of energy when all the muscles about the knee joint are synergically contracted in order to produce fixation. This brings us to realize that the greatest manifestations of muscle energy are concerned with fixation and to bear in mind the enormous reserve of power that is present in a muscle beyond producing a movement. Hence we come to appreciate the tremendous signficance of paralysis and to understand that when voluntary function is returning in a muscle and a slight degree of contraction is present, how far that muscle is from having recovered sufficient power to produce the weakest effective movement in the smallest joint, without considering the exertion of its most powerful function.

Our most powerful movements are concerned with fixation and it may be said that no effective movement may be carried out unless fixation is present in some part of the body. For instance, in delivering a blow the arm is projected forward with great force; but it would be quite ineffective if the limb were not at the moment of impact rigid as a rapier, with the muscles controlling the joints in a state of synergic contraction.

Again, in the sweeping stroke of the sabre the muscles of the hand and wrist are strongly contracted in the fixation involved in gripping, while the muscles acting on the scapula insure by their fixation that the shoulder blade provides a rigid but movable platform for the humerus.

Hence we understand that, when fixation is required in a joint, more powerful contractions occur and the greater the amount of resistance to be overcome, the firmer must be the fixation and, only when the greatest amount of resistance is encountered, do we see the maximum output of muscle energy and the most tremendous efforts to effect fixation. This is because, apart from the great effort against gravity, there must be overcome the strain produced by the momentum of the powerful movements of the muscles that depend on fixation as the basis of their function, and there must also be withstood the staggering shocks the limb receives as its momentum is asserted and thrown back.

It is interesting to observe the muscles in grasping. With a weak grip this action is not associated with any great manifestation of muscle power; but, as the grip is tightened, the extensors and the flexors of the wrist are seen to come strongly into action and with progressive increase in strength of the grip the *biceps* and *triceps* are seen synergically to tighten up and eventually the deltoid and other scapulo-humeral muscles contract violently and with them the muscles connecting the humerus and the scapula itself to the trunk. When the greatest efforts are carried out it will be seen that with the body in the erect position practically all the muscles are in action with the exception of those of the disengaged upper limb, those of the leg and thigh contracting in order to provide stability for the body and the neck muscles fixing the cervical vertebræ and the head in order to allow for the effective action of such muscles as the *trapezius* and sternomastoid in stabilizing the clavicle and scapula.

It is obvious therefore that in carrying out the simplest function the action of muscles and of groups of muscles, not directly concerned with the movement, are contracting and that, when greater muscular efforts are made, although apparently the indication may be for a local and comparatively insignificant display of muscle energy, groups far distant are drawn into action and perhaps all the muscles of the body involved.

We may say that there is a powerful spread of impulses occurring to activate adjacent and distant groups of muscles when the more powerful call is made on the activity of a particular muscle or group of muscles.

The force needed to provide rapid movement at a joint is of course greater than that required to provide the same movement more slowly, in accordance with the formula $F = \frac{mv}{t}$. Here we have merely to consider a difference in degree of the muscle action and of force, depending no doubt on a difference in intensity of action of the muscle or muscles concerned and not on any change in character; the outstanding phenomenon is that reciprocal shortening and elongation of the muscles concerned directly in the movement takes place. But when the requisite movement has been accomplished, for instance when the fingers have been carried from a relaxed and extended position to one of flexion and an object grasped, then, in order to grip it firmly and retain it against resistance, there must be such a spread of impulses that muscles quite distant are brought

[1] These measurements were made with simple apparatus at the Base Hospital, Melbourne, some years ago, during brief intervals snatched from heavy work. They may not be quite accurate, but are sufficiently so for the purpose of this article.

into action. Not only that, but there must be a change in character of the impulses concerned, because, instead of the contraction and lengthening of antagonistic muscles taking place, the joints are fixed and the muscles acting on them in a state of synergic contraction.

Its Illustration.

This principle was well illustrated by certain war injuries that were often mistaken for functional conditions. As a result of some injury a given muscle would be weak and unable to carry out an appropriate movement in part or entirely; persistent efforts to do so would cause the activation of adjacent muscles and the contraction of all these muscles would fix the joint in an undesired position.

An example of this was furnished rather commonly by injury to the deltoid muscle. The injury may have been inflicted directly on the muscle by a blow from a spent missile or from earth thrown up by an explosion or the injury may have been sustained by the nerve itself or the joint. In any case there was a temporary weakness of the muscle as a result; perhaps a temporary paralysis and the limb was carried in a sling or hanging beside the body. As the local pain subsided and the bruising cleared up, efforts would be made to abduct the arm, but on account of the weakness of the muscle that movement could not be carried out. More and more violent and unsuccessful efforts would be made, as a consequence of which, instead of the opposers of the deltoid relaxing, they would undergo synergic contraction, for the simple reason that the powerful impulses sent down were particularly associated with fixation and involved a spread of impulses and the activation of muscles other than those primarily concerned in the desired movement; hence the arm would be fixed in accordance with the strength of the deltoid and far from the position desired. This confusion in attempting to carry out a simple movement is not a functional condition, as the term is ordinarily used in medicine; but it was sometimes regarded as such and the unfortunate man might receive a paternal pat on the back and be advised to get back to work much to his bewilderment, if he had been trying to use the arm for years, which was sometimes the case. The trouble is that as time goes on and persistent efforts are made to elevate the arm, a vicious circle sets in, since such muscles as the *latissimus dorsi* and *pectoralis major* hypertrophy and so accentuate the difficulty. Later on things become worse by contracture occurring in the great muscles referred to, to such an extent that the arm may not be elevated under general anæsthesia, although the shoulder joint is free. But the most troublesome of all phenomena to deal with is perhaps the sensitiveness of the nerve centres that occurs. As a result of this all the muscles concerned spring up into a condition of powerful contraction when the slightest effort is made to abduct the shoulder (see Figure IX).

Reference may also be made to a similar phenomenon occurring in ulnar paralysis. Here, as a result of the two medial or inner lumbrical muscles being paralysed, the equilibrium of the corresponding metacarpo-phalangeal joints is upset and we get hyperextension occurring at these joints. As the delicate little paralysed muscles of the hand are recovering—two of the lumbricals, the *interossei* and the muscles of the hypothenar—so called reeducation is commonly practised, abduction and adduction exercises of the fingers being carried out. As these little muscles have never in my experience regained sufficient power to produce movement the abduction and adduction are produced by the extensors. The amplitude of such movements usually carried out by the extensors is, however, not great and efforts are made to increase it. The consequence is that, instead of the required movements being increased to any great degree by extensor action, there occurs a spread of impulses and fixation results; the spread involves the flexors and thumb muscles acting on the wrist, all are activated and a claw like effect is produced. The hyperextension of the proximal phalanges is increased and the deformity accentuated; therefore the delicate little muscles that are recovering and producing a just perceptible contraction, much too weak to effect movement, are dragged upon. If Hilton's doctrine of rest to injured parts embodies a sound principle, is not this a supreme example of its disregard? On the perfect function of these fragile little muscles some of our most skilful movements depend. Is not their disturbance at a critical period harmful? Does the unsatisfactory result of the present treatment of ulnar paralysis lie in this disturbance of injured parts?

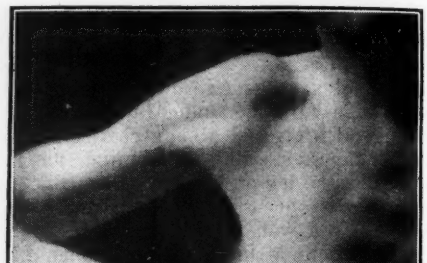

Figure IX.

The arm in this case may be abducted without difficulty to an angle of about 45°; but an attempt to raise it beyond that level results in a synergic contraction of all the muscles acting on the joint and its fixation in the position illustrated.

Principle III: The Reciprocal Action of an Antagonistic Muscle Cannot Voluntarily be Suppressed or Reversed.

Its Explanation.

We cannot compel a muscle whose function it is to contract synchronously with others in a given group, to act in opposition to those other muscles.

By transplanting it to a position on the side of a joint opposite to that of its fellows in such a way that it lies amongst the muscles that oppose those of its own natural group, and by inserting it adjacent to those muscles that naturally oppose its action, or by attaching it to them we cannot make it function synchronously with and similarly to its natural opposers. Nor, conversely, can we prevent it from contracting when the muscles of its natural group contract, should it retain sufficient vitality to do so after the great disturbance it has undergone in the process of transplantation.

The reason in this is concerned with the co-ordinate contraction and elongation of antagonistic muscles.[7] That phenomenon is dependent on the integrity of a reflex arc *viâ* the spinal cord. The arc was laid down in embryonic life in accordance with the developing anatomy of the part and it is difficult to imagine that any interference with the normal anatomical disposition could cause a corresponding rearrangement of the fibres connected with the presiding centre in the cord. The conduction along these paths is not merely mechanical, the central nexus in the cord exerting a guiding influence in correspondence with the law of forward direction.[8]

In the carrying out of delicate movements, where so precise a balance is required amongst the muscles for the interplay of their contractions and relaxations, active effective function of the transplant would not occur. It must be valueless as an active agent. It would, however, function where fixation is required, in which case in response to more powerful impulses all the muscles acting on the joint synchronously contract, the actual value of the transplant in these circumstances depending on the mechanical advantage with which it acted in its new position, the degree to which its vitality had survived the gross disturbance associated with the actual process of transplantation and the extent to which the balance of the joint had been upset by removing a powerful muscle from its fellows. But perhaps the greatest use of the transplant lies in its passive action as a sling or support and that depends on the amount of tension present in the muscle after the operation. Again, this tension seems largely a matter of chance, as it is impossible to know to what exact degree the muscle will relax in a given individual under various degrees of anæsthesia.

Its Illustration.

This principle may be illustrated particularly by consideration of the effect of the operation for transplantation of the *flexor carpi radialis* to the back of the forearm in cases of paralysis of the musculospiral nerve. There appears to be a belief amongst some who are interested in this class of work, that the transplanted muscle becomes intrinsically an extensor by the rough and ready process of altering its insertion. J. B. Murphy referred to this operation as a method of "transplanting flexor tendons and converting them into extensors"[9] and he wrote of "getting complete restoration of function within four weeks." So well known a writer on medical subjects as Sir Arthur Keith states, in referring to

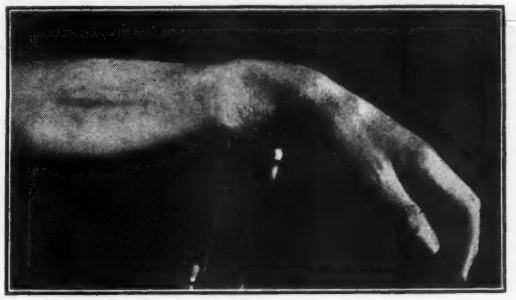

FIGURE X.
The hand is at rest. It is slung up by the transplated *flexor carpi radialis* which has been sutured under such tension that when all muscles are relaxed, as in the illustration, the dorsal surface of the hand makes an angle of about 30° with that of the forearm.

the operation, that the transplanted muscle is now driven as a member of the extensor team.[10] It is not quite clear what that means, for all the extensors are paralysed, but, if he believes that the transplant becomes intrinsically an extensor (which would imply that the reflexes *viâ* the cord have been rearranged correspondingly), it can only be stated that such is entirely at variance with my experience, which is, that the patient can never be taught to relax the transplanted muscle while he contracts the group from which it is divorced. All that he can do is to contract or relax the transplant synchronously with the muscles of its original group. The transplanted muscle, therefore, would prove a most unruly member of a team and would not pull its weight, illustrating again the old adage that a horse may be led to water, but he cannot be forced to drink.

The operative results of transplantation of the tendon of the *flexor carpi radialis* for musculospiral paralysis were uneven. Some that were unsatisfactory, were due apparently to faulty technique or accident; others possibly to changes of an ischæmic character having occurred in the trans-

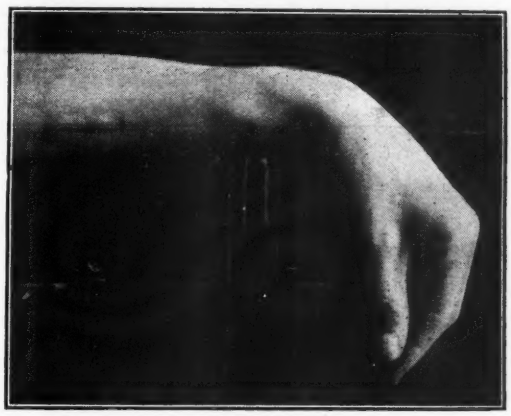

FIGURE XI.
This shows active flexion of the wrist with extended fingers, giving a movement of fifteen degrees beyond the passive position shown in Figure X.

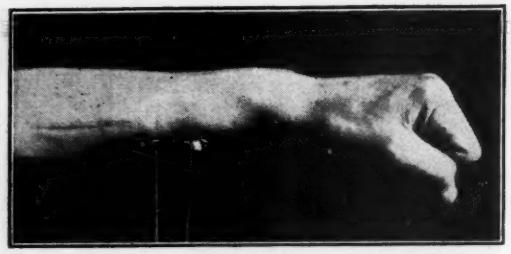

FIGURE XII.

Extension of the wrist is produced by strongly closing the hand. It would not be quite correct to say that the wrist has been actively extended. The position has been brought about by the synergic contraction of all the sound muscles acting on the wrist and the position so assumed depends partly on the tension under which the *flexor carpi radialis* is sutured and partly on the relation in a given case of the power of the transplanted muscle to that of the remaining flexor muscles.

plant. Although in these unsatisfactory cases the estimation of functional value and the elucidation of causation were interesting, it would be confusing to introduce them here.

Apart from those, the cases appear in three groups that lend themselves very readily to illustration.

The first group is composed of cases that at first sight are liable to be regarded as bad operative results from the functional point of view. When the forearm muscles are relaxed, the wrist flexes and the hand falls, its dorsal surface making an angle of about 30° with that of the forearm (see Figure X). On active flexion of the wrist with extended fingers a further 15° of movement is obtained (see Figure XI) and when the hand is strongly closed the wrist is carried into extension (see Figure XII) but not beyond. There is wanting the strong-looking position of hyperextension that impresses us so much by its appearance of power. It is to be noted, however, that the hand in this group of cases may be carried through an arc of 45° and that the fingers at every point along an arc of 90° are capable of executing some useful movement. With flexion pins can be picked up with a minimum of muscular effort, not sufficient to evoke any appreciable antagonistic movement and by the strong synchronous action of all the muscles acting on the joint the wrist may be completely extended and a powerful grip obtained. The wrist cannot, however, be carried

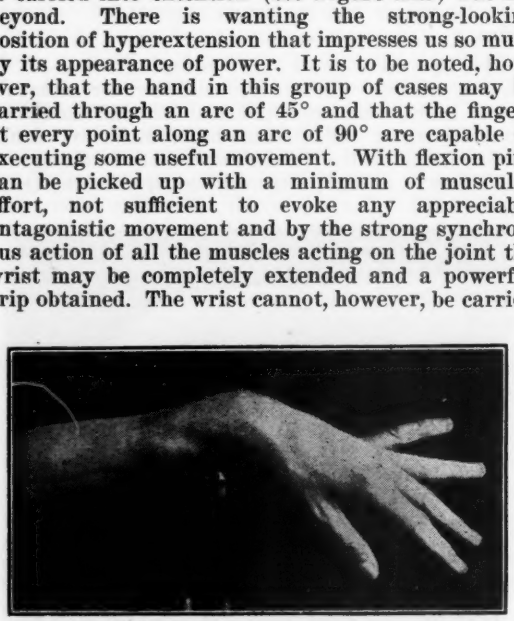

FIGURE XIII.

Wrist extension with extended fingers cannot be carried out if the *flexor carpi radialis*, after being sutured in the transplanted position, lies sufficiently slack to allow of a useful degree of flexion. This figure shows the futile attempt to do so.

FIGURE XIV.

This illustration shows that there is no mechanical cause for the inability to hyperextend the wrist: the inability must be explained on physiological grounds.

into the extended position with extended fingers, since that would involve the reciprocal elongation of the remaining flexors whilst the transplanted *flexor carpi radialis* contracted, which is not possible. Figure XIII illustrates that.

That the limitation of movement to a position of extension is not due to any complication, such as adhesions in the joint or of the flexor tendons, is shown by Figure XIV, in which the joint is carried back passively to a position of extreme hyperextension—dorsiflexion.

These cases provide the best functional results seen by me and apparently demonstrate one of the results that Murphy sought, being illustrated in one of his publications. Figure XV is reproduced from "The Clinics of John B. Murphy."[11] It is to be noted, however, that the wrist is shown extended with extended fingers. As the illustration is entirely diagrammatic, I do not consider that it furnishes satisfactory evidence that such an operative result is obtainable, particularly as there is no detailed reference to it in the text.

The particular case illustrated by Figures X to XIV gives without exception the best functional result of any I have seen. The operation was carried

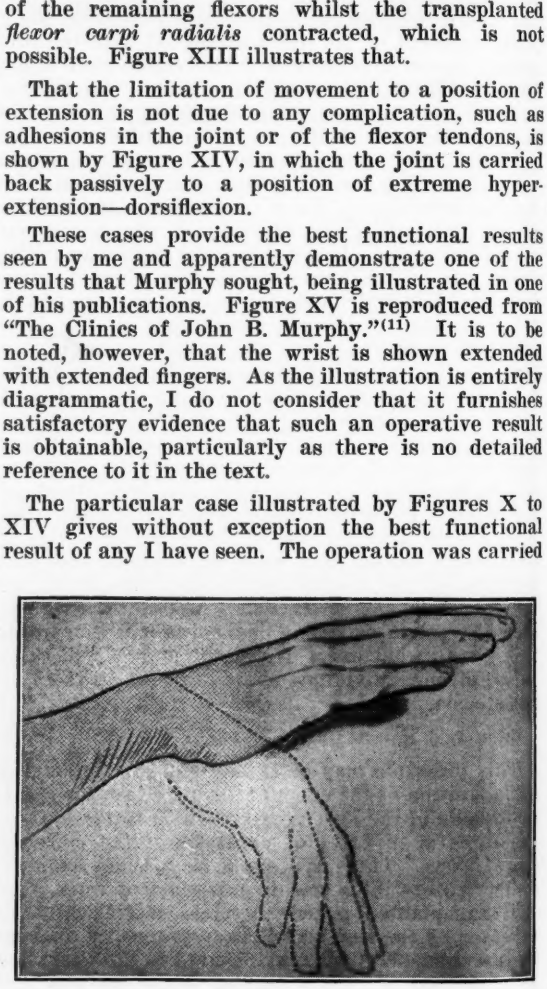

FIGURE XV.

Reproduced from "The Clinics of John B. Murphy." As it is not a photographic record, it cannot be regarded as furnishing convincing evidence that such an operative result has been obtained.

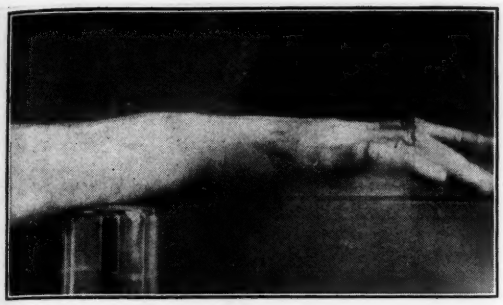

FIGURE XVI.
This is an example of the cases in which the tendon of the transplanted *flexor carpi radialis* was sutured under such tension that when all muscles are relaxed the wrist joint lies in a position of extension with extended fingers.

out by a master of plastic surgery, the late Mr. William Moore, of Melbourne.

The second group comprises those cases in which the tendon of the *flexor carpi radialis* is sutured under such tension that the wrist joint occupies a position of extension with extended fingers when at rest, that is all muscles relaxed (see Figure XVI). In this position the hand is less favourably situated for carrying out delicate useful movements, as the fingers cannot be flexed completely nor the thumb opposed and an awkward movement of the elbow and shoulder is required to bring the fingers to a level surface such as a table. As the tendon of the *flexor carpi radialis* is under greater tension in this operative result, the range of movement is necessarily less than in the first example illustrated. With all muscles synchronously contracted the hand assumes a position of hyperextension or dorsiflexion (see Figure XVII) and so mistakenly may be regarded as more powerfully placed than in the first operation. A good grip may be obtained in this position, provided that the object grasped is fairly large; but there is necessarily a much smaller range of grip here than in the former group. The functional results of this operation are therefore less good than those of the first group. This operation is another that was carried out by John B. Murphy. Figures XVIII and XIX are taken from photographic reproductions illustrating his writings.[12] It is seen how closely they resemble Figures XVI

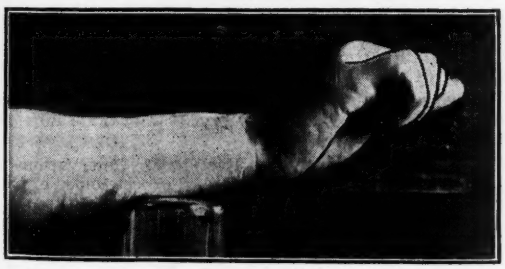

FIGURE XVII.
The wrist is carried into hyperextension by attempting to close the hand. This movement must not be regarded as an intelligent and purposeful hyperextension. The tension in the transplant is such that, when all muscles are synchronously contracted, the hand occupies the position illustrated.

FIGURE XVIII.
A result obtained by operation by J. B. Murphy. Compare with Figure. XVI.

and XVII, from photographs in one of our Australian Imperial Force cases.

The third group comprises those cases in which the wrist was fixed in extreme hyperextension by

FIGURE XIX.
A result obtained by operation by J. B. Murphy. Compare with Figure XVII.

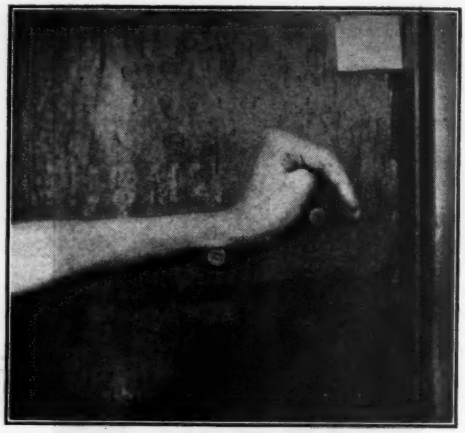

Figure XX.
The hand is at rest; all muscles are relaxed.

the transplanted tendon. All patients who were subjected to this type of operation and who subsequently came under my observation, had a very poor functional result, having but a claw hand—an ugly immovable hook with the limitations of such an apparatus. The patients were without exception very disappointed with the result; neither could they pick up small objects nor grasp anything in the palm, large or small. Figure XX, showing the hand at rest, Figure XXI, illustrating strong efforts being made to grasp an object and Figure XXII, showing the greatest effort being made to open the palm, sufficiently demonstrate the want of functional value.

It is difficult to understand why this type of operation was ever carried out. Perhaps the operator believed in two fallacies. In the first place, that a transplanted muscle would acquire new connexions in the cord and, becoming intrinsically an extensor, would act in physiological harmony with, but in opposition to the flexors from which it had been divorced; that is he failed to recognize Principle III, enunciated in this paper. And in the second place, that, by fixing the wrist in extreme hyperextension, he was placing it in the strongest

Figure XXI.
This is an attempt to close the hand. It is a coincidence that the flexed fingers are in contact with the turned in thumb; they are not gripping it, nor is their flexion limited by its presence.

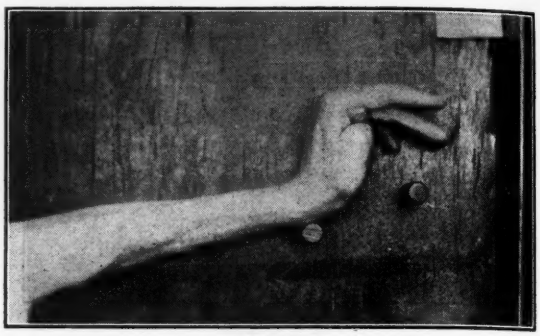

Figure XXII.
This is an effort to open the palm.

possible position, but that is not so. The hyperextended position does not appear to provide a stronger grip than is obtainable with any degree of lesser extension. The various degrees of hyperextension merely allow the hand to occupy convenient positions for grasping and so economize the movements of the elbow and shoulder and conserve energy. Perhaps the commonest uses of the hand when the wrist is hyperextended to an extreme degree, are to carry out pushing movements with extended fingers and that of the cupped hand with flexed fingers. In these cases the postures are almost entirely passive as far as the wrist is concerned.

Apart from that, there are limits beyond which the reciprocal lengthening and shortening of the flexors and extensors may not be demonstrated; as a consequence there is little power in flexion of the fingers when the wrist itself is strongly flexed, nor in their extension when the wrist is hyperextended to an extreme degree. Indeed in many persons these extreme movements cannot be carried out at all.

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Reports of Cases.

THE OCCURRENCE OF GLYCOSURIA AFTER TRAUMA TO THE LIVER: REPORT OF TWO CASES.

By A. K. Green, M.B., Ch.M. (Sydney),
Resident Medical Officer, Sydney Hospital, Sydney.

Case I.

D.A., a male, aged ten years, was admitted to hospital under the care of Dr. C. E. Corlette on July 7, 1926. He was knocked down by a motor-bus. It was not known whether the wheel passed over his body. On admission the patient complained of severe epigastric pain; he manifested extreme pallor and was coughing up blood.

Examination revealed that the pulse was rapid, 160 per minute and thready. Respiration was rapid, shallow, with an expiratory grunt and was chiefly thoracic.

The upper part of the abdomen was held rigid; there were abrasions over the right iliac crest and the right costal margin. On palpation there was tenderness over the whole of the upper portion of the abdomen, most pronounced in the right hypochondrium. This area was rigid, though not board-like. Tenderness was also present over the left lower ribs, with crepitus on auscultation.

On percussion there was increased dulness in both flanks, resonance in the mid-line and no alteration of the liver dulness. Nothing else was discovered in the physical examination.

A specimen of urine, collected some hours after admission, had a specific gravity of 1032; the reaction was acid; it reduced both Fehling's and Benedict's solutions; acetone was present; no blood nor albumin was found.

The sole treatment was absolute rest in the dorsal position for two weeks, with morphine during the first two days. Convalescence was uneventful and the patient was discharged on July 27, 1926.

The sugar had disappeared from the urine by the third day.

The diagnosis was "ruptured liver and fractured ribs."

Case II.

J.T., a male, aged fourteen years, was admitted under the care of Dr. C. E. Corlette on August 3, 1926. He was run over by a motor lorry, the wheel passing over his body. On admission he complained of severe pain in the right side of the chest, worse on deep breathing and of severe thirst. His colour was good. There was no vomiting.

Examination revealed regular pulse, of moderate volume, force and tension and with a rate of 110. Respiration was slightly restrained. The chest manifested diminished movement on the right side with some swelling over the lower right ribs posteriorly. Great tenderness was present in the right axilla and along the right costal margin. No crepitus was elicited. There was dulness on percussion at the right base with diminished breath sounds, crepitations and friction crepitus on auscultation.

There were abrasions over the right side of the ilium, abdomen and chest. Extreme tenderness was present in the right hypochondrium and right loin, with rigidity in the right hypochondrium. There was no dulness in the flanks and the liver dulness was normal. Nothing else was discovered on physical examination.

Urine, obtained some hours after admission, had a specific gravity of 1030 and yielded a heavy deposit with Fehling's and Benedict's solutions. No other abnormal constituents were found.

The treatment was similar to that of the previous case.

Convalescence was uneventful and the patient was discharged in twelve days. The sugar disappeared from the urine in twenty-four hours.

The diagnosis was "fractured ribs, with hæmothorax and contused liver."

Comment.

These cases are reported to draw attention to the occurrence of glycosuria after injuries to the liver. As far as I have been able to ascertain, this is not mentioned in any surgical textbooks, large or small. Glycosuria after liver injuries is possibly not infrequent, if looked for.

It is not difficult to see that after severe injury the organ should show some disturbance of its glycogenic function. In these cases there has probably been excessive glycolysis following stimulation by the injury.

Acknowledgment.

I wish to thank Dr. Corlette for permission to publish these case reports.

THE USE OF SPINAL ANÆSTHESIA IN POST-OPERATIVE ILEUS.

By L. S. Woods, M.B., B.S. (Melbourne),
Albury, New South Wales.

It is most noticeable to anyone who has used spinal anæsthesia for abdominal surgery, how often the emergency patient who is unprepared by enema or aperient for operation, spontaneously evacuates the bowels on the theatre table a few minutes after the spinal injection.

Sometimes this occurs quietly just after the abdomen is opened and the overpowering smell of fæces causes a certain degree of apprehension to the operator, who may think it is coming from within the abdominal wound.

This evacuation, however, seems to be a great benefit in an acutely distended abdomen, for it relieves the distension, making the operative procedure easier and lessens the risk of a postoperative ileus developing.

Alsina[1] writes: (i) That the increase of intestinal motility produced by spinal anæsthesia is due to a temporary blocking of the preganglionic fibres of the splanchnic by the anæsthetic which becomes diffused into the subarachnoid space; (ii) a proof of this action of spinal anæsthesia on intestinal motility is furnished by section of the splanchnic nerves, when the results are similar to those obtained by spinal anæsthesia.

Duval[2] states that in certain cases of intestinal obstruction (more particularly in cases of postoperative ileus) spinal anæsthesia is a most efficacious form of treatment. The mechanism whereby this acts, probably depends on the fact that the ileus is produced by stimulation of the peripheral nerves of the intestine which act on the centre in the medulla. The effect of the spinal anæsthetic is to suppress the inhibitory impulses and this brings about active peristalsis owing to the free action of the excitatory nerves.

The undoubted efficacy of spinal anæsthesia to relieve a postoperative ileus is related in the following case.

Clinical History.

In October, 1920, T.J.S., a shearer, was operated on at the Sydney Hospital for ruptured gastric ulcer a couple of hours after perforation. The ulcer was small and situated on the anterior surface of the stomach in the pyloric region. This was closed in the usual way with purse string sutures and his convalescence was uneventful. He was discharged in three weeks.

On September 2, 1927, he had a second perforation when he was working out on a sheep station and unfortunately it was twelve hours before he was brought to operation.

The abdomen was opened under ether anæsthesia. It was full of turbid fluid, the gut was distended and the viscera were engorged and red. Many adhesions from the former flooding of the peritoneum with gastric contents caused difficulty in locating the site of the perforation. The pylorus was matted with adhesions, but after these were freed, this region was investigated closely and showed no signs of past or present ulceration. A chronic ulcer was found on the anterior wall of the stomach close to the greater curvature well towards the cardiac end. It had ruptured and the perforation would almost admit the tip of the finger. It was closed by sutures and an omental graft. A suprapubic tube was employed to drain the pelvis and the abdomen was closed.

After treatment included Fowler's position, the administration of saline solution and brandy *per rectum* every four hours, strychnine, 2·2 milligrammes (one-thirtieth of a grain), alternating with 0·5 cubic centimetre of

"Pituitrin" every four hours by hypodermic injection. Sips of water were allowed twelve hours after operation.

Twenty-four hours after operation the patient was vomiting small quantities of brown fluid, he suffered from intermittent hiccup and his breathing was distressed. His pulse was 120, its volume was improving. The drainage tube was acting well.

Forty-eight hours after operation he was still vomiting small quantities of brown fluid at frequent intervals with very little effort, he was hiccupping and his chief complaint was a feeling of tightness in the abdomen and difficulty in breathing. His temperature was 37·8° C. (100° F.), his pulse rate was 110 and his respirations numbered 28. The abdomen was very distended and tympanitic. The bowels were not open for two days prior to operation and he had not passed flatus or fæces since. Three high turpentine enemata were given at intervals of two hours with one cubic centimetre of "Pituitrin" and 0·6 milligramme (one-hundredth of a grain) of eserine sulphate given hypodermically ten minutes before each enema. The first returned some brownish fluid and a little flatus. The other two returned clear with no flatus.

After sixty hours his general condition was much the same; he was vomiting and hiccupping and was distressed with his breathing. He was then taken down from Fowler's position and rolled on his side. Five-tenths of a cubic centimetre of "Stovaine" solution (Chaput's formula) was injected intrathecally between the third and fourth lumbar spines. The patient was then placed on his back with a pillow under the buttocks and another under the shoulders in an endeavour to allow the spinal anæsthetic to run as far as the sixth dorsal vertebra. The resulting anæsthesia reached to 2·5 centimetres (one inch) below the nipple line. Exactly five minutes after the injection a most gratifying sound of intestinal gurgling was heard, followed immediately by a rush of fæces and flatus into the bottom of the bed. The evacuation was so profuse and vigorous that it was heard all over the ward. This continued intermittently for a few minutes and then ceased.

The effect on the patient was dramatic. His colour improved almost immediately and his respirations slowed from 28 down to 22 in the minute. The abdomen was soft and considerably flatter. He said that he felt more comfortable, had lost the tight feeling and could breathe more easily. A couple of hours later his vomiting ceased entirely and from that time onwards he had no difficulty in passing flatus and his bowels were easily moved by simple enemata and aperients.

As far as the abdominal condition was concerned, the patient then progressed admirably, but later on he developed signs in his chest. On the fifteenth day after the operation the patient suddenly collapsed and died during an exploratory needling of the base of the left lung. An autopsy was not performed.

Conclusion.

Although based upon the experience of only one case, it appears that spinal anæsthesia has some place among the somewhat limited ways and means at our disposal in treating postoperative ileus. It is often difficult to treat satisfactorily and when other more simple and recognized methods fail, a dead end is reached, with only the prospect of further operative treatment which is not always successful. At this stage it seems that spinal anæsthesia is worth a trial. In general practice these cases are not frequent and it is to be hoped that someone with more opportunity will test the method more fully.

Acknowledgment.

I have to acknowledge my indebtedness to Dr. C. E. Winston, of the Sydney Hospital, for the preoperative history of this patient.

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(1) F. D. Alsina: "Spinal Anæsthesia and Gastric Motility," *Révista Médica de Barcelona*, March, 1927, page 227; abstracted in "Epitome of Current Medical Literature," *The British Medical Journal*, July 9, 1927, page 7.

(2) P. Duval: "Spinal Anæsthesia in Intestinal Obstruction," *Bulletins et Mémoires de la Société Nationale de Chirurgie*, February 19, 1927, page 169; abstracted in "Epitome of Current Medical Literature," *The British Medical Journal*, April 2, 1927, page 65.

Reviews.

A MANUAL OF DERMATOLOGY.

Robert W. MacKenna, of Liverpool, has presented the second edition of his "Diseases of the Skin."[1] The new edition has been revised and enlarged to four hundred and fifty pages. In all there are thirty-six coloured plates and one hundred and forty-three illustrations, most of which are excellent reproductions.

The book is divided into twenty-six chapters, the classification being based chiefly on ætiology. At the end is a very full index. The author has included many useful prescriptions, not merely mentioning the names of the drugs, as is usually the course adopted by other authors. Very helpful aids to diagnosis are the tables showing the chief points of differentiation between various skin diseases likely to be mistaken one for the other. These clearly show the main features of each in a very handy and concise manner.

Mention is made of some of the latest methods of treatment, for example thallium acetate for *tinea tonsurans* and of bismuth for syphilis.

On page 124 MacKenna states that "Neo-Salvarsan" "is much less efficacious than the original 'Salvarsan.'" We cannot altogether agree with this statement and think that the author has rather exaggerated the difference of efficiency between "606" and "914" and in view of his statement it is rather surprising that he makes no mention of the administration or technique of giving "606" injections, but confines himself to "914."

The book is an excellent and complete work and can be thoroughly recommended to practitioners.

X RAYS IN SKIN CONDITIONS.

A book of two hundred and two pages, "Röntgen Rays in Dermatology," by Dr. L. Arzt and Dr. H. Fuhs, Professors at the Riehl Clinic for Dermatology and Syphilology at Vienna, has recently been translated from the German by Dr. C. Kevin O'Malley.[2]

The first fifty pages are devoted to the physics of X rays, a description of apparatus, dosage and method and regulation of exposure. Nearly all the remainder of the book is divided into chapters dealing with the authors' method of treating various skin diseases.

The list of skin diseases mentioned as being suitable for treatment by X rays is large, a full index of these appears at the end of the volume and this also includes the index to the chapter on physics *et cetera*.

A useful chapter is that in which the author describes X ray injuries and another on their treatment and the medico-legal aspect of these is likely to call forth appreciation. This book will be most useful to those who possess coil sets and who follow the technique as regards dosage. Very small mention is made of the Coolidge tube and of the interrupterless transformer.

The apparatus described and illustrated is of Austrian and German manufacture and on this account the text may be of less value to Australians.

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[1] "Diseases of the Skin: A Manual for Students and Practitioners," by Robert W. MacKenna, M.A., M.D., B.Ch. (Edinburgh); Second Edition, Revised and Enlarged; 1927. London: Baillière, Tindall and Cox. Royal 8vo., pp. 462, with illustrations. Price: 25s. net.

[2] "Röntgen Rays in Dermatology: A Handbook for Practitioners and Students," by L. Arzt, M.D., and H. Fuhs, M.D.; Authorized Translation by C. Kevin O'Malley, M.C., M.B., B.A.O., B.C.H., M.Sc. (N.U.I.), D.M.R.E. (Cambridge); 1927. London: Baillière, Tindall and Cox. Royal 8vo., pp. 216, with illustrations. Price: 18s. net.

The Medical Journal of Australia

SATURDAY, OCTOBER 15, 1927.

The Significance of Research.

Members of the medical profession who are in general practice, are apt to forget that an understanding of disease is rarely accomplished at the bedside, that the knowledge on which diagnosis and treatment are based, has been gained largely in the laboratory and that if research work were stopped, progress in medical science would be impossible. The position today is anomalous. The research worker with but few exceptions is paid an inadequate salary for his valuable contributions to knowledge. The result is that there is a mere handful of graduates in medicine devoting themselves to research. It requires the keenest intellect, endless patience and perseverance, unusual ingenuity and intense interest in endeavouring to fathom the unknown. Those who are endowed with these qualities, realize that in general or special practice they can earn a very comfortable competency. At times the urge of the laboratory, the love of research compels them to sacrifice the tempting lure of practice and a substantial income. Some enter practice and find time for laboratory work or clinical research. The majority, however, have too much worldly wisdom and in consequence leave research severely alone. It is difficult to find men willing to apply for the few positions available in Australia for laboratory teachers or investigators. On the other hand many highly competent practitioners are satisfied to demand good fees from patients without giving a moment's thought to the fact that they owe their knowledge to a considerable extent to the underpaid research worker.

The Walter and Eliza Hall Institute of Research in Pathology and Medicine has recently issued its eighth annual report. In the pages of this little volume we find a record of much important work and at the same time we find confirmation of the statements made above concerning the lack of attraction of the laboratory to the medical profession as a whole. The Institute started the year with a sum just under £5,200. It received from the Trustees of the Walter and Eliza Hall estate, from the University of Melbourne, from the Commonwealth Government, from sundry donors and from interest a further sum of £4,900, making a total income of £10,127. Out of this income just over £4,000 were paid in salaries and wages. The permanent full-time staff comprises eight persons and the part-time workers number seven. It must be obvious to all that this sum is not large for its purpose. The wages of the attendants and cleaners are fixed by awards; the salaries of trained scientists are determined by the amount available.

The Walter and Eliza Hall Institute has proved itself a highly valuable instrument for the accession of knowledge. With its small endowment it has achieved a great deal, but there should be provision for many more workers and a living for each one. The recently established Baker Institute suffers in the same way.

Australian medicine has attained a high place, thanks to the scientific spirit of a small band of workers. But it is unwise and unreasonable to rely on altruism for the maintenance of this great reputation. If research work were attractive, if there were a good career open to competent investigators and a well-organized training school for men and women who would wish to devote their time and energies to this kind of activity, we could look confidently into the future, for Australian graduates working in Australia would contribute at least Australia's share to the stock of common knowledge.

The remedy must come from within the medical profession as well as from without. As long as the general practitioner and the specialist are unmoved by this deplorable lack of support of the essential work, the public will continue to endow medical research in a half-hearted manner. Medical practitioners could charge their patients an additional sixpence for each fee of one guinea to be handed over to a research fund. By doing this the medical profession would demonstrate its recognition of its indebtedness to research for the ability to diagnose diseases and to treat them. Perhaps the time will come when the medical profession will be in the happy position to be able to record

its indebtedness to research in connexion with the prevention of disease. Millionaires help those who help themselves. If the medical profession supplied the evidence of its concern about the neglect of the most important branch of medical activity, the public would believe that its welfare and prosperity depends to a great extent on the advance of medical knowledge. There is no safer investment than the spending of money for the furtherance of the understanding of disease. It is unnecessary to promise the discovery of deadly diseases such as cancer. But each scrap of knowledge that brings us nearer to a full knowledge of the nature of disease, is an advance toward its prevention.

Current Comment.

SCIATICA.

Sciatica may be primary or secondary. When the nerve is actually involved in a pathological process, the condition is primary. This is rare. When the pain is a manifestation of a disease occurring apart from the nerve, as in such conditions as lead poisoning, diabetes, syphilis or alcoholism, it is secondary and sciatica occurs more commonly in this than in the primary form. In these circumstances the sciatica is merely a symptom and must not be looked upon as a disease *sui generis*. Sciatica occurs, however, in a large group of persons in whom no obvious cause can be found. To this, the largest group, the term idiopathic sciatica has sometimes been applied. The use of the word idiopathic in this connexion must be regarded as a confession of ignorance. It has been recognized during recent years that a cause can frequently be found. In July, 1925, there appeared in this journal an article by George S. Strathy, of Toronto, Canada, in which he expressed the opinion that fibrosis about the sacrum or arthritis of a sacro-iliac or lumbo-sacral joint is frequently the cause of sciatica.

An important paper on the pathogenesis of sciatic pain has recently been published by V. Putti, of Bologna, Italy.[1] Putti points out that the sensation of pain is due to irritation of sensory nerve fibres in some part of their course and he refers to the work of Dejerine and Sicard. Dejerine described a clinical picture of radiculitis, a form of pain resulting from disease of the nerve roots. Sicard has gone further and has differentiated another type which is due to stimuli affecting the segment of the nerve between the spinal root and the plexus, as it traverses the intervertebral canal. This segment of the nerve trunk he has named the funiculus and the pain syndrome, caused by irritation at this level, he has regarded as due to funiculitis. Putti gives a diagram setting out the conception of pathological lesions of spinal nerves, based on the work of Sicard. This includes radiculitis, ganglionitis, funiculitis, plexitis and neuritis. The question may be raised as to whether the use of one of these terms might not give rise to the impression that an inflammatory process would be confined rigidly to one segment of the cord, that there would be a line of demarcation or of limitation. This is, of course, very unlikely. As long as classification into many groups is made with the object of elucidating the nature of disease, it is useful; its frequent artificial nature must not be forgotten. In this instance the classification is useful because it brings into prominence the importance of the skeleton, the vertebral element, as Putti calls it.

The importance of the vertebral column in the causation of sciatica was demonstrated by the work of Goldthwait on lumbar sacralization. It was thought that this condition led to narrowing of the intervertebral lumen between the fifth lumbar vertebra and the first segment of the sacrum. This conception caused some surgeons to remove the transverse process of the fifth lumbar vertebra in an attempt to cure sciatica. Though some successes were recorded, results were not always up to expectations. Putti points out that sacralization of the fifth lumbar vertebra is often present without any associated symptoms referable to the lumbo-sacral plexus. The fourth lumbar nerve contributes to the formation of the plexus and it is often possible to demonstrate that the pain is due to the involvement of this root and not of the fifth, which can alone be affected by lumbar sacralization. Lumbar sacralization is a congenital anomaly and Putti believes that with reduction in size of the intervertebral foramen would be associated a smaller nerve root and that this would eliminate the probability of compression. For these reasons lumbar sacralization must be considered as one, but by no means the most frequent or severe cause of sciatica.

It is recognized that an attack of sciatica is often preceded by what is known as lumbago, this is generally of so-called rheumatic origin. Putti lays stress on this point and on the fact that too much attention has been paid to the bodies of the vertebræ rather than to the articulations of the spinal column. The structure of the intervertebral foramen is important. It is formed above by the intervertebral notch. In front lies a portion of the posterior aspect of the body above, portion of the intervertebral disc and a portion of the posterior aspect of the body below. Behind lies the posterior articulation. This articulation is of great importance in the causation of sciatica. The typical articulation of the lumbar region lies in the sagittal plane. In the articulation between the lumbar vertebra and the sacrum the articular surfaces lie in the frontal plane; they revert to the thoracic type of arrangement. Putti has found that this arrangement is subject to considerable variation. He holds that anomalies in this arrangement may have a twofold effect on the intervertebral foramen. In the first place they may alter its shape and reduce

[1] *The Lancet*, July 9, 1927.

its capacity and in the second place by altering the mechanics of the spine they may induce a localized arthritis which may irritate the nerve trunk. It may be granted that the existence of the anomaly in question might alter the size and shape of the foramen, but that the second effect postulated by Putti would occur is not quite clear. He states that such an anomaly might "induce a localized arthritis" by altering the mechanics of the spinal column. For the acceptance of this statement it would have to be shown that the majority of persons with an abnormal arrangement of the facets in the lumbar vertebræ suffer from an arthritis at the site of the abnormality. He adds that "this effect may also be produced by all the inflammatory processes that have their seat in the vertebral articulations." He probably means to convey that the anomaly may predispose to an arthritis. Some of the other anatomical points brought forward by him are of interest and importance. It has been shown that the intervertebral foramina are not all of the same size. The foramen between the fifth lumbar vertebra and the sacrum is always the smallest, that between the fifth and fourth lumbar vertebræ is next and the foramen between the fourth and third usually the next in size. On the other hand the fifth nerve is always the largest, the fourth comes next in size and the third as a rule is next in size, though sometimes the second and third are about the same size. In other words the fourth and fifth lumbar nerve roots are predisposed on anatomical grounds to be affected more than any others by changes in the canals through which they pass. Other predisposing causes are discovered when the funiculus, that portion of the nerve trunk lying within the foramen, is considered. Bonniot and Forestier have shown that the fourth and fifth nerves have the longest funicular portion of those which constitute the lumbo-sacral plexus. The funicular portion of the nerve, unlike the intraspinal portion, does not lie within the arachnoid, but is clothed only by *dura mater* and is not bathed in cerebro-spinal fluid. Around the funiculus there is a very rich venous plexus which it is presumed is much influenced by mechanical conditions outside the funiculus. The absence of the arachnoid and therefore of a protective layer of fluid exposes the funiculus to outside mechanical influences, such as do not affect the root, while the surrounding venous plexus puts it at the mercy of any congestion and stasis that may occur in the neighbourhood from many causes. Putti goes on to discuss the questions of diagnosis and treatment of sciatica. His statements on these aspects of the subject are naturally based on the anatomical conception put forward by him as to its cause. Those who are interested in this aspect are advised to study his article, they will be well repaid. The most important part of the subject is the pathogenesis. What was formerly regarded as "idiopathic" has been shown to have a pathological basis. The recognition of this will lead to treatment along the right lines. Symptomatic treatment will give place to a search for the cause of the arthritis; its early removal offers the best prospect of cure.

PITUITRIN IN OBSTETRICS.

The use of pituitrin in obstetrics has been discussed in these columns on several occasions and attention has been drawn to the dangers associated with this practice. In June, 1926, reference was made to rupture of the uterus following the use of pituitrin in a labour which had to be terminated by the application of forceps and manual removal of the placenta. As far as pituitrin is concerned, medical practitioners may be divided into two groups, those who are opposed to its use in obstetrics and those who hold that when it is used with care, it constitutes a valuable therapeutic agent.

A recent paper by J. Hofbauer and J. K. Hoerner is calculated to add to the second of these groups.[1] These authors recognized the limitations and dangers of the hypodermic administration of the drug and sought to find a more effective and less dangerous method of administration. They thought that if they could apply the pituitary extract to some mucous membrane they might obtain a slow and steady absorption and also, that it might be possible to withdraw the drug to prevent further absorption as soon as the tendency of the uterus to pass into tetanic contraction became noticeable. After using oral administration for a while, Hofbauer and Hoerner elaborated a technique of intranasal application. They point out that solutions applied to the nasal mucous membrane pass almost immediately into the general circulation both by the blood stream and by lymphatic absorption. They also discuss the possibility of such solutions passing through lymphatic channels directly to the subarachnoid space and refer to observations by Simon Flexner in favour of this path. It is not necessary to trace the steps by which they have arrived at their method of administration, it must suffice to state that absorption from the nose occurs in waves rather than continuously. They applied 1·2 cubic centimetre (twenty minims) on a pledget of cotton wool to one nostril. At the end of an hour the pledget is withdrawn and a fresh one applied to the other nostril for a similar length of time. As a rule one to three applications resulted in the induction of labour. They give the results obtained in eighty cases. Labour was induced successfully in fifty-six cases of toxæmia, postmaturity, severe pyelitis, hydramnios and dead fœtus. Nine failures occurred when the method was tested in normal, pregnant women during the last month of pregnancy and at term. This method is worthy of further trial in view of the fact that administration of the drug may be suspended on the appearance of untoward symptoms. At the same time it must be remembered that it is inexact. Much mucus will be thrown out by the mucosa and it is unlikely that all the pituitrin will be absorbed from the cotton wool. The obstetrician will not know how much of the drug his patient has received.

[1] *American Journal of Obstetrics and Gynecology*, August, 1927.

Abstracts from Current Medical Literature.

BACTERIOLOGY AND IMMUNOLOGY.

A Bacteriological Study of Pulmonary Embolism.

Edward C. Rosenow (*Journal of Infectious Diseases*, March, 1927) reports the isolation of a diplostreptococcus from the embolus or thrombus in each of five cases of pulmonary embolism and from the thrombus in a case of portal thrombosis. Twelve years ago the author had succeeded in recovering the same organism in each of a number of similar cases. The author discusses the histories of several patients. These may be summarized as follows: 1. A female, aged fifty-three died suddenly from pulmonary embolism five days after hysterectomy. 2. A female, aged sixty-eight, died from pulmonary embolism eight days after amputation of the breast for ulcerating carcinoma. 3. A female, aged forty-two, died suddenly from pulmonary embolism four days after vaginal hysterectomy. 4. A female, aged sixty-one, died suddenly from pulmonary embolism thirty-three days after a clean operation of pegging an ununited fracture. 5. A male, aged fifty-nine, died two days after herniotomy. 6. A male, aged forty-nine, died from portal thrombosis and peritonitis seven days after partial gastrectomy for gastric carcinoma. The technique employed in the author's investigations was as follows: The emboli or thrombi were fixed in 10% formalin solution, blocks were embedded in paraffin and sections ten microns thick were stained by a modified Gram's method. This consisted in staining deeply with gentian-violet or methyl-violet solution, fixing in the iodine-potassium-iodide solution and decolorizing with alcohol to a pale blue instead of to the end as recommended in the Gram formula. In this way the cells appear pale blue and the bacteria dark purple. Two ligatures were placed around the vessel containing the embolus or thrombus and the portion between was removed with sterile precautions. The specimen was dipped in alcohol and the alcohol was ignited. The wall of the vessel was then carefully separated and three pieces of the thrombus or embolus, about one centimetre long, were removed and washed repeatedly in sodium chloride solution. One piece was placed in 10% formalin, one was emulsified in sodium chloride solution with mortar and pestle and one was cut into small blocks with sterile shears. Media affording a wide range of oxygen tension were inoculated including blood agar plates, glucose brain broth, glucose brain agar and low columns of broth. Emulsions of emboli and thrombi were also inoculated into tall columns of 2% dextrose broth. The number of colonies of the diplococcus recovered was never large and growth occurred first in the deeper layers of the glucose brain agar shake cultures of emulsions. Primary cultures on blood agar and in low columns of broth never yielded the organism, but subcultures grew readily on these media. Cultures from heart blood, liver, spleen and kidneys were sterile in four cases. The diplostreptococcus was recovered from the blood in one. The diplostreptococcus is Gram-negative and resembles the pneumococcus in size, shape and grouping. It forms short chains in broth, has no capsule and on blood agar plates it produces small dry colonies usually surrounded by a zone of green or brownish colour. All strains fermented dextrose, lactose and raffinose, two fermented inulin and salicin and one mannite also. Numerous animal experiments were carried out. Of thirteen mice inoculated with the organism only three died, of eighteen guinea pigs four died and of twenty-six rabbits nine died. Seven dogs were inoculated and three developed thrombosis of veins and two thrombosis and embolus of pulmonary artery. Cultures from the blood and thrombi yielded the diplostreptococcus in pure growth. The author as a result of these findings studied the microscopic picture of pulmonary emboli and thrombi that had been preserved from twenty-six similar cases during 1925. The specimens had been preserved in 10% formalin. In sections from all but two of these specimens a diplostreptococcus identical morphologically with the one described was demonstrated.

Removal of Anticomplementary Substances with Hydrochloric Acid.

Susuma Uchida (*Journal of Infectious Diseases*, May, 1927) gives details of the result of his investigations into the use of Sachs's method of dealing with anticomplementary serum. The method is given in detail. Two specimens of serum from patients undergoing antisyphilitic treatment which were found to be anticomplementary in the fresh state and thirteen specimens which had become anticomplementary as the result of bacterial contamination, were examined by the method. All thirteen specimens had previously yielded a reaction with Kolmer's test for syphilitic infections. The method was found fairly satisfactory. Acidulation appeared to remove most of the anticomplementary substances, but removed also a small amount of antibody. The method is therefore most useful with serum which yields a strong reaction and which contains only small amounts of anticomplementary substance.

Antigenic Relations of the Tubercle Bacillus.

Boris Abadjieff (*Journal of Bacteriology*, November, 1926) in his experiments on the antigenic relations of tubercle bacilli has shown that the substances responsible for allergy in the tuberculous animal are not identical with those which react with specific serum antibodies. Dienes and Schoenheit and Dienes, Schoenheit and Scheff had obtained results which indicated to them that there was a close parallelism between antigenic preparations which fixed complement and those which gave positive results to skin tests in tuberculous animals. These workers imply an identity of the two factors and the probability that the active substance is of a protein nature. Abadjieff carried out further experiments and confirmed his previous findings. His observations indicate that the skin reactive factors are directly the reverse of the complement fixation properties. He concludes, therefore, that it is unlikely that the two functions reside in the same chemical constituent of the tubercle bacillus or of old tuberclin.

The Bactericidal Action of Mercurochrome.

Leonard Colebrook and Ronald Hare (*British Journal of Experimental Pathology*, April, 1927) review the results obtained by various workers in the use of mercurochrome. Hill and Colston and Hill and Scott reported that the drug, when administered intravenously to rabbits, sometimes conferred some slight bacteriostatic power upon the blood for an hour or two after the injection and that it was excreted into the urine and bile, rendering these fluids bactericidal. Hill and Scott stated further that experimental infections with *Bacillus typhosus* of the gall bladder of rabbits were completely and rapidly cured by intravenous and oral administration of the drug. Young, Hill and Scott recommend the intravenous injection of mercurochrome in cases of septicæmia and severe local sepsis and its employment for treatment of typhoid carriers has been suggested. More recently further laboratory work has thrown some doubt upon these earlier conclusions. Walker found that the addition of mercurochrome, ranging from one part in twenty-five thousand to one part in four hundred, to human blood definitely favours the growth of staphylococci and streptococci in that blood. Meyer, Sommer and Eddie found that the intravenous injection of the drug into rabbits confers only an insignificant bactericidal power upon the bile and they failed to cure experimental gall bladder infections due to the *Bacillus typhosus* in these animals. In view of the discrepancies between these results the writers determined to investigate further the bactericidal power of mercurochrome. Two series of *in vitro* experiments were carried out. In the first graduated dilutions of mercurochrome were made in distilled water and of these in each case one part was added to nine parts of defibrinated human blood. After one hour at room temperature the specimens of blood were centrifuged and the serum pipetted off. The bactericidal power of this serum was then determined, staphylococcus and streptococcus (hæmolytic)

being used as the test organisms. Twenty-five cubic centimetres of each serum with five cubic centimetres of the microbic emulsion were incubated in capillary pipettes and the infected serum was inoculated into melted agar plates. In the second *in vitro* experiment samples of defibrinated human blood were mixed with mercurochrome as in the previous experiment. Each sample was then infected with staphylococci and its bactericidal power determined by "inculturing" in slide cells. These experiments showed that the addition of mercurochrome to human defibrinated blood *in vitro* conferred no bactericidal power to staphylococcus and hæmolytic streptococcus and that the bactericidal effect of normal human blood upon staphylococci is impaired by the addition to it of one part in ten thousand of mercurochrome. The *in vivo* experiments showed that blood derived from a rabbit which has been given a maximal dose of mercurochrome, possessed no bactericidal power for *Bacillus typhosus* and the normal bactericidal power for *Bacillus typhosus* possessed by the serum of this rabbit was not increased by the drug. These findings suggest to the writers that the administration of mercurochrome is not likely to be followed by an increase of bactericidal power either in the blood stream or the bile. They suggest that the beneficial results reported to have followed injections of the drug in some cases of septicæmia may be due, not to the direct action of the drug on the microbic infection, but to an auto-immunization process.

The Weil-Felix Reaction in Mild Typhus (Brill's Disease).

Leon C. Havens (*Journal of Infectious Diseases*, April, 1927) describes results obtained with the Weil-Felix reaction in cases of Brill's disease. In almost one thousand macroscopical tests no false reactions were obtained. All the patients whose serum yielded a reaction, were found upon investigation to have the characteristic clinical features of Brill's disease. In over one hundred cases of the disease the reaction was obtained in 95% during the second week or later. The reaction does not usually develope during the first week, but becomes increasingly stronger until convalescence. Agglutination of *Bacillus proteus* X19 in dilutions higher than one in eighty has not been obtained in other diseases. The author deprecates the value of the microscopical test with dried blood as by this method false reactions are obtained. The agglutinins for *Bacillus proteus* X19 in serum from patients with Brill's disease are destroyed by heating at 62° C. for one hour.

Bacteria in Duodenal Contents.

Arthur Isaac Kandall, Alexander A. Day, Arthur William Walker and Rena Cordelia Haner (*Journal of Infectious Diseases*, June, 1927) have studied the duodenal contents of fifty adults none of whom presented symptoms indicative of duodenal disease. The duodenal tube with orifice sealed with gelatine or other similar substance was used to collect the material for examination, the use of the tube being controlled by fluoroscopic examination. The patient brushed the teeth carefully and used a mild antiseptic gargle immediately before the examination and had taken no food for at least the preceding twelve hours. The material obtained was inoculated within two hours into plain and sugar broth and milk. One cubic centimetre of duodenal contents was allowed for each one hundred cubic centimetres of media. Incubation under aerobic and anaerobic conditions was carried out; 52% of the specimens manifested little or no growth and smears stained by Gram's method contained practically no bacteria. The organisms most frequently recovered were the *Bacillus mucosus capsulatus* group, *Micrococcus ovalis*, staphylococci, coliform bacilli, streptococci and the mesentericus group. *Bacillus welchii* was very abundant in three of the specimens. No direct evidence of a microbicidal action of the duodenum or its contents was detected. The relative abundance of members of the *mucosus capsulatus* group, of the enterococcus and of staphylococci suggests that these organisms are easily adaptive to the duodenal environment. The authors surmise that one essential condition for the growth of *Bacillus welchii* is a low acid content in the duodenum.

HYGIENE.

Rheumatism in Childhood.

Ll. J. Llewellyn (*The Journal of State Medicine*, February, 1927) states that of all the maladies that cast their shadow over childhood's happy hours, rheumatism is perhaps the most sinister. The prevalence of organic heart disease in England is a standing menace to the community and it is estimated that of the total number of deaths from heart disease from 50% to 60% are due to rheumatism. It is in childhood that the seeds of rheumatism are sown and it is to be regretted that rheumatism does not as yet figure as a scheduled disease on the list of defects issued by the Board of Education. This being the case exact figures as to prevalence of rheumatism in the school population are not available. Both English and American authorities agree that when rheumatism attacks children under twelve years of age, about 80% become affected by heart lesions. The origin of rheumatism in childhood is still unknown. Many hold that it is due to a microbic infection; but while some have found organisms, others of equal repute have failed and there, pending further research, the matter stands. The sudden onset of rheumatism is apparent, not real. For the growing pains *et cetera* are the outcome of a number of factors previously and insidiously working together to produce rheumatism. There are certain mental and physical characteristics of the child who tends to develope rheumatism, in other words the prerheumatic child and the following measures are suggested to prevent this child from becoming affected. Medical supervision should be continuous from infancy to school age. A register should be established of children with a family history of rheumatism who, therefore, are liable to be affected by the disease, namely the prerheumatic children. Steps should be taken in such children to strengthen their natural defences against weather changes by domestic hydrotherapy and other measures of skin and oral hygiene. Children showing signs of thyreoid deficiency or excess with or without goitre or thyreoid enlargement should be the object of special study and their thyreoid instability as far as possible should be corrected. In view of the insidious origin of heart mischief periodic examination of their heart's action should be made at short intervals. Parents should be warned that over-fatigue and deficient sleep may lead to heart disease or St. Vitus's dance. All the measures suggested in regard to the prerheumatic are applicable to prevent recurrence in the rheumatic child. The ideal place for a child with rheumatism is a hospital bed.

After Treatment of Encephalitis Lethargica.

G. A. Borthwick (*The Journal of State Medicine*, February, 1927) gives a report on the first year's working of the unit at the Northern Hospital, Winchmore Hill, London, for the observation and treatment of the after-effects of *encephalitis lethargica*, epidemic encephalitis or sleepy sickness in children of both sexes aged from three to sixteen years. The unit consists of one hundred beds and the patients occupy four pavilions of twenty-five beds each, two being for girls and two for boys. No patient below the age of three years is accepted. Hopelessly bedridden, paralysed, incontinent patients are excluded. Patients with slight infections, presenting neither physical nor mental symptoms in any recognizable degree, are refused. When such mental deterioration has followed the original attack of epidemic encephalitis as to reduce the patient to the level of the mental defective, admission is refused, since other arrangements exist for the treatment of these children. When the diagnosis is doubtful or more than doubtful, the patients are not accepted. On admission a preliminary note is made of the patient's general physical and mental condition. No treatment is given at first, except that of the ordinary discipline of school and hospital. After a short stay a complete physical and mental examination is made and the classification of the patient determined. Various forms of medicinal treatment are then prescribed and massage, remedial exercises and electric treatment are instituted if necessary. The experimental unit has not been productive

of any very positive curative results so far and its future value may well be that of a clearing house for patients suffering from any of the many residua of *encephalitis lethargica*. The matter of disposal is, of course very complicated, not only because of the heterogeneous sequelæ of the disease, but also because so many of the patients show more than one manifestation of the post encephalitic state.

A Medical Examination Before Marriage.

Georges Schreiber (*The World's Health*, February, 1927) discusses the problem of a medical examination before marriage. While a periodical medical examination is warmly advocated in general, it is, of course, most strongly to be recommended before marriage. Although the proposal itself is not objected to, the moment there is a question of putting it into practice, differences of opinion are revealed among doctors, the legal profession and sociologists. The countries that have attempted to solve this problem, may be classed in two categories: those demanding medical examination or certificates before marriage and those which have merely established official or private institutions which recommend or facilitate such examinations. A medical examination before marriage was first made a legal institution in the United States in 1919 by the State of Washington, but the law was later revoked. It was adopted with amendments by seven other States, in the majority of which the law applies only to men, the certificate merely stating that there is no sign of venereal disease. In North Carolina and North Dakota women must also present certificates, but in their case the declaration need only state that they do not suffer from any contagious tuberculous disease or mental weakness. The certificate should not be dated more than seven to fifteen days previously, the period varying according to the State. Public laboratory examinations (Wassermann, gonococcus and tubercle bacillus tests) are made free of charge. In other States legislation exists for the prevention of the spread of venereal disease by marriage without the enforcement of a marriage declaration. The Scandinavian law demands the registration by a doctor of the declaration made by the contracting parties as to their state of health. Given under oath, these declarations have the effect of awakening the conscience as to sex responsibilities. In the Netherlands a society has been formed to further the cause of prenuptial examinations and with this in view pamphlets are distributed in certain towns to persons contemplating marriage. In Germany a ministerial decree of February 19, 1926, advocates the establishment of prenuptial consultative centres and such institutions are already active at Dresden, Berlin, Hamburg, Magdeburg and other towns and they work in cooperation with the local health insurance societies. The writer considers the many disadvantages attendant upon an obligatory prenuptial medical examination render such a regulation undesirable, but he would welcome the institution of a compulsory prenuptial medical certificate and make the medical examination optional.

Silicosis Among Hard-Ground Workers in Coal Mines.

N. Tattersall (*The Journal of State Medicine*, April, 1927) draws attention to one particular form of underground work in coal mines which inevitably leads to the condition known as silicosis of the lungs, very frequently accompanied by tuberculosis. These cases are found to occur in men working with machine drills in what are known as hard headings. In coal mining it frequently happens that the continuity of the seam of coal is broken in places by the occurrence of a "fault" and a tunnel has then to be driven through the rock adjoining the coal measures in order to reach the seam of coal at another level. Similar tunnels are often driven through the rock from one seam to another for ease of working. These tunnels are known as "hard headings," are usually 2·7 metres (nine feet) or 3·6 metres (twelve feet) wide and about 1·8 metres (six feet) high. For the last twenty to twenty-five years this work has been done by what are known as "machine" or "blast" drills, operated by a dry process; consequently workers coming out of these headings are as white as millers, with hair, eyes, mouth and nose choked with fine dust. Samples of dust taken from four headings in the Cymmer and Glyn Neath area show 61·6% of silica in the Cymmer headings and 57·7% and 56·7% in two others at Glyn Neath. The author describes the symptoms, signs and other clinical features observed in a series of twenty-two cases.

The Minimal Lethal Dose.

W. W. C. Topley (*The Journal of State Medicine*, March, 1927) in the third of the Harben Lectures, 1926, discusses that type of experiment in which it is desired to determine the protective or curative value of various agents. Dealing first with the problem of protection, there is a tendency to apply the concept of the minimal lethal dose in experiments of this kind. It is very common to find the results of a given test expressed in the form that ten cubic centimetres of serum A will protect a given animal against γ minimal lethal dose of bacterium B. A perusal of the protocols of the titration will usually show that the method of procedure has been to keep the amount of serum constant and to vary the amount of bacterial culture inoculated. The conclusions arrived at in the previous lecture when the determination of the minimal or average lethal dose were discussed, are applicable to the question at issue and even approximately accurate results cannot be expected by the method outlined above. The frank abandonment of the minimal lethal dose concept and the comparison of total mortalities in different samples inoculated with a uniform and appropriate dose of bacteria offer the best hope of obtaining the kind of information required, but even so the task is far from an easy one. A series of experiments, illustrating the very considerable difficulties which may be encountered in investigations of this kind, are detailed. In therapeutic experiments on infected laboratory animals, the difficulties are even greater owing to the lack of homogeneity within a sample of animals drawn from normal stock. The animals in a sample taken some hours or days after infection will differ among themselves even more widely. At the time when the experimenter intervenes with his therapeutic agent, the animals may be in very different stages of infection, for there is no way of regulating the rapidity of spread of the bacterial parasite or the rate of establishment of a toxæmia. The best way of arriving at a definite conclusion would appear to consist in using large numbers of animals, including in the survey several treated and untreated samples, so that some idea of the actual standard deviation within each group may be arrived at. The difficulty of determining the value of any therapeutic agent obviously increases as the observer passes from acute diseases, terminating in rapid death or recovery, to subacute or chronic diseases. The author concludes with a discussion on statistical methods in the experimental study of infective disease.

Experimental Electric Shock.

R. W. I. Urquhart (*Journal of Industrial Hygiene*, April, 1927) has carried out an investigation into the causes of death from electric shock with a view to ascertaining if anything further can be done to aid in the resuscitation of its victims. Many researches have been undertaken to discover if possible the cause of death in such cases and to formulate suitable remedial measures to protect those exposed to the possibility of such accidents. The men in the field on the other hand, have been concerned mainly with the perfection of safety appliances and with the adoption of preventive regulations in order that these untoward accidents may be reduced to a minimum. The practice, now almost universal, of instructing the field worker in the recognized principles of resuscitation, has been the means of saving many lives. With the increasing use of electric energy in industry, however, the number of casualties continues to grow, owing either to the lack of immediate application of the now known principles of resuscitation or to fatality in spite of their efficient application. The experiments described in this article confirm the deductions of previous observers as to use of death in electric shock,

namely that it may be due to primary cardiac failure, to primary respiratory failure or to a combination of both. In laboratory animals, when the current traverses the body from the head to a hind limb, about 45% of the deaths are of purely cardiac origin. The remainder of the deaths occur because of failure of the respiratory movements. In these, as in the group in which the current is passed directly through the brain, a condition of profound paralysis or block becomes established in the respiratory, vagus and vasomotor centres. That the block involves these centres is shown by experiments which demonstrate clearly the absence in electrocuted animals of reflex effects normally functioning through them. Since the nerve centres become insensitive to extraneous influences, counter stimulation is not an aid to recovery. No definite histological changes can be made out in the brain to account for the symptoms. The capillary hæmorrhages which occur, do not appear to be significant. The experiments also show definitely that when the electric current does not cause charring of nerve structures the paralysis or block is recovered from and the reflexes return, provided efficient artificial respiration is applied. It is of the greatest importance that artificial respiration be applied early and be maintained for a sufficient length of time. Owing to the nature of the block in the nerve centres the ordinary tests for death should not be accepted and "nothing less than cooling of the body or onset of *rigor mortis* should be considered to be evidence of death."

Medical Examinations and Welfare in Cotton Factories.

W. F. DEARDEN (*The Journal of State Medicine*, May, 1927) reports that welfare departments are now becoming a prominent feature in cotton factory administration in England and where they are in vogue it is proving to be a distinct advantage to place in the hands of the welfare supervisor the first selection of those under sixteen years of age and in some cases of those under eighteen years of age who seek employment. The certifying surgeon is brought into close touch with this official when visiting the factory to carry out his own particular part in the selective process. He makes his examinations in the welfare department and the supervisor attends to the carrying out of his instructions and recommendations. The certifying surgeon is necessarily a much greater success under such conditions than he is when it is no one's special duty to follow up his work. Indeed this association between medicine and welfare is proving of such value at many cotton factories that the respective managements have deemed it an advantage to make special arrangements with the doctor to extend his functions beyond the statutory limit. These involve a more detailed examination with card indexing of the results, examination of all entrants under eighteen years of age, reexamination every year of all under this age, supervision of first aid and ambulance equipment, examination at the request of the supervisor of operatives complaining of symptoms which might have relation to the nature of their employment and the advising of the supervisor on medical or hygienic matters arising in connexion with the work. The author also considers it would be an advantage to add to these extended duties the examination of employees returning to work after two or more weeks' absence through illness. Moreover, the supervisor should be assigned the duty of keeping a record of every absence over three days' duration resulting from illness and of the nature of such illness. The items in this record would require tabulating and this should be done each year under the direction of the doctor. The condition obtaining in connexion with cotton manufacturing processes are described. Industrial welfare is being well taken up by Lancashire cotton firms. One body has thirty well trained lady supervisors allocated amongst the various associated establishments, some concentrating their energies on one particular factory and others dividing their time between two factories. At a considerable number of the mills arrangements have been made with the certifying surgeon on somewhat similar lines to those mentioned. With respect to the extent and degree of accommodation for welfare purposes, this should cover a well equipped and comfortable office for the supervisor; a first aid room arranged throughout on aseptic principles, provided with hot and cold water, with a suitable porcelain foot bath in addition to the regulation sink and lavatory basin and with a water closet adjacent; a reasonably sized, light and airy rest room capable of being warmed when necessary and a waiting room. A well managed canteen is also a valuable asset to a cotton mill. The canteen can be used as a recreation room in the evening. Other directions in which the activity of the supervisor may be shown, include the establishment of cricket, football, hockey and swimming clubs, a lending library, the organizing of dances, concerts, lectures and certain classes, including a first aid class, the making arrangements for summer trips to the seaside at a cheaper inclusive rate, the obtaining entry into convalescent homes of those recovering from severe illnesses, the home visiting of absentees *et cetera*.

Acute Respiratory Infections Among Motormen and Conductors.

H. S. DIEHL, M. CONNELLY and D. D. TURNACLIFF (*The Journal of Industrial Hygiene*, May, 1927) with the hope of obtaining some additional data on the epidemiology of colds made a study covering a six-year period of the incidence of acute respiratory infection among motormen and conductors employed by the Minneapolis Street Railway Company. There is no health problem in industry which compares in importance to the so-called acute cold. Most persons when they contract colds, lose little or no time from their duties, but the number of persons affected each year is so large that the aggregate time lost from colds far surpasses that from any other disease. In the cars used on the Minneapolis lines the motormen are enclosed in booths in the front of the cars, while the conductors stand just inside the rear doors, at stations in the midst of the stream of passengers, to collect fares as the passengers enter or leave the cars. Averaged for the six years 9·8% of the motormen and 13·1% of the conductors lost more than one day each year from colds. The economic yearly loss from these colds, calculated on an average wage of four and a half dollars per day, was slightly over four thousand dollars.

The Cardiac Patient in Industry.

H. E. MOCK and S. P. MOORE (*The Journal of Industrial Hygiene*, May, 1927) record the result of a study made by the Chicago Heart Association of thirty-four industries covering physical examination records of nearly 400,000 men. As a result of this investigation the Association now proposes to establish a workshop laboratory under scientific supervision which will cover a job induction period for cardiac defectives, certified by the Association for certain positions which they are found competent to fill. At this workshop laboratory there will also be undertaken fatigue studies of scientific value designed to develope a series of work tolerance tests for general use. The economic cost of heart disease mounts to an unmeasured degree under haphazard systems and exclusion policies, without careful medical examination and periodic physical tests. The fact that there are cardiac defectives who are unemployable in competitive jobs, but who are still able to work, calls for a State-wide conservation programme which will permit the economic and curative benefits of regular and remunerative work. Until workmen's compensation ceases to charge industry with undue responsibility with regard to heart defect, a workshop such as proposed will have to be sponsored by an outside agency under full cooperation and support of employers. Scientific management with its job indices and its intensive study of individual workers offers an excellent opening for corresponding performing indices of handicapped workers. Placement work that is planned on a precision basis will be in better odour than haphazard employment methods as generally used at present. Medical emphasis must be placed elsewhere than at the point of cardiac breakdown. The British method of providing arthritis units and hospital care for rheumatism as the most important cause of heart disease in age groups under forty is a case in point. Coordinated, continuous work with a definite objective through scientific groups similar to the Chicago Heart Association is to be credited with the development of a new health viewpoint and a new public health technique.

The College of Surgeons of Australasia.

A MEETING OF THE COUNCIL OF THE COLLEGE OF SURGEONS OF AUSTRALASIA was held in the B.M.A. Building, 30 to 34, Elizabeth Street, Sydney, on September 28 and 29, 1927. The President, SIR GEORGE SYME, occupied the chair and Dr. H. S. Newland, Dr. Ralph Worrall, Mr. H. B. Devine and Dr. A. L. Kenny, Honorary Secretary, were present.

Site for the College in Canberra.

SIR GEORGE SYME reported that together with Dr. A. L. Kenny and Mr. H. B. Devine he had visited Canberra and had interviewed Sir John Butters, the Chairman of the Federal Capital Commission, to discuss the possibility of a site being reserved in Canberra for the College. Sir John Butters had pointed out an area of five acres which had been reserved for medical scientific bodies. He was prepared to recommend to the Federal Government that a site should be reserved in this area for the College. The site proposed was adjacent to the Museum of Comparative Anatomy and opposite the site of the university. It was on the crest of a ridge on the north-western side of the city, close to Parliament House and near the suburb of Ainslie.

Sir John had offered to facilitate the holding of the first meeting of the Fellows of the College in Canberra, if the College determined to hold this meeting. He was very anxious that scientific societies should hold their general meetings in Canberra. He suggested that after Parliament had risen in February there would be more accommodation available in the hotels.

Report of the Executive Committee.

DR. A. L. KENNY, the Honorary Secretary, read the report of the Executive Committee appointed on February 5, 1927. The report was adopted on the motion of Dr. Ralph Worrall, seconded by Dr. H. S. Newland.

Report of the Executive Committee.

The Executive Committee with great regret report the deaths of two of the Founders of the College, Thomas Fiaschi, of Windsor, New South Wales, and A. J. Brady, of Sydney, New South Wales, and of one of the Foundation Fellows, W. Moore, of Melbourne, Victoria. Drs. Fiaschi and Moore were members of Credentials Committees. Letters of sympathy were sent to the relatives.

C. E. Corlette, one of the emergency Founders nominated at the delegates' meeting in August, 1927, was appointed a Founder in the place of Thomas Fiaschi. The New South Wales Founders suggested William Chisholm to replace Thomas Fiaschi on the Credentials Committee for New South Wales and this was approved. It will be necessary for the Council to confirm this appointment and to appoint a Fellow to act in the place of W. Moore, Reginald Morrison being suggested.

The honour of knighthood has been conferred upon Sir Louis Barnett and Sir Charles Clubbe and letters of congratulation were sent.

There are forty Founders and one hundred and sixty-three Foundation Fellows, forty-six in New South Wales, forty-five in New Zealand, thirty-six in Victoria, fifteen in South Australia, twelve in Queensland, six in Western Australia and three in Tasmania.

Soon after the return of its members from the New Zealand Congress the Executive Committee commenced to meet every Tuesday from 1 to 2.30 o'clock p.m. and has continued this practice to the present. At its earlier meetings Dr. Newland was able to be present, at a later meeting Professor Sandes was present. Sir George Syme, Mr. Devine and Mr. A. L. Kenny have attended all of the meetings and have kept in touch with Professor Sandes and Dr. Newland by correspondence.

Dr. Colvin Storey suggested that Fellows of the College should use the prefix "Mr." rather than "Dr." This matter is before the Council for discussion.

The New Zealand Branch of the British Medical Association sent a letter from the Executive Committee of the second session of the Australasian Medical Congress (British Medical Association) in Dunedin covering letters from the Dunedin and Wellington Chambers of Commerce protesting against the word Australasia in the title of the College, urging it should be Australia and New Zealand. The reply sent indicated that this matter had been exhaustively discussed in Sydney at the delegates' meeting in August, 1926, and at meetings in Dunedin in February, 1927, and that there was agreement that the title should be "The College of Surgeons of Australasia which includes New Zealand."

Form of application for membership was prepared, also form of *questionnaire* to be sent to references indicated by applicants.

The account of the College was placed in the Union Bank of Australia Limited, Collins Street, Melbourne, and the Honorary Secretary and Treasurer was empowered to operate upon the account.

Subscriptions to the Endowment Fund were received from seven members:

Sir George Syme	Dr. Acland
Mr. Gordon Craig	Dr. J. Ramsay
Dr. W. N. Robertson	Sir Donald McGavin
Sir Lindo Ferguson	

Promises were received from Dr. D. S. Wylie and Mr. H. B. Devine.

The amount of the Endowment Fund was placed in the Savings Bank of Victoria, Head Office, Melbourne, and the Honorary Secretary and Treasurer was authorized to act upon the account.

Regulations for Honorary Fellows from outside the Commonwealth and Dominion were drawn up.

Legal advice as to Vigilance Committees and Trustees was obtained.

The President has discussed the question of a site for a College building at Canberra with Sir Neville Howse and with the Chairman of the Federal Capital Commission and has inspected a proposed site.

A form of certificate of Fellowship has been prepared.

The By-Laws were grouped as well as possible, printed and distributed to all Fellows. Applicants for Fellowship are also furnished with copies of the By-Laws.

The Executive Committee has very carefully studied the By-Laws and has consulted its Solicitor. A revised form of the By-Laws with Regulations separated from them will be submitted for the approval of the Council before being dealt with at the annual meeting.

Particulars of the requirements of the Australasian Universities as to the higher degrees in surgery have been obtained.

The attention of the Registrar of the University of Sydney was drawn to the resolutions regarding the higher degree in surgery passed at the eleventh session of the Australasian Medical Congress in Brisbane.

The selection and election of Foundation Fellows for each of the States of the Commonwealth and for the Dominion of New Zealand has been successfully completed. The task was long and arduous.

The American College of Surgeons has been officially informed of the Foundation of the College.

The question of the enrolment of junior members was discussed and referred to the Council.

Mr. Gordon Craig, who is to attend the meeting of the American College of Surgeons in Detroit, United States of America, in October, 1927, has been supplied with all necessary information regarding the development of the College.

Through THE MEDICAL JOURNAL OF AUSTRALIA an announcement has been made that the College is now ready to receive applications for Fellowship. A number of applications have been received from Victoria, several from New Zealand, a few from New South Wales and odd ones from Queensland.

The Executive Committee has formulated plans for the annual meeting having regard to the great importance to the College of that meeting.

Financial Statement.

The Honorary Treasurer read the financial statement. There was a credit balance at the Union Bank of Australia of £1,014 2s. 9d. on September 20, 1927, and the amount to the credit of the Endowment Fund in the

Savings Bank of Victoria was £174 15s., on which interest of 11s. 7d. had been added on July 1, 1927. It was moved by Dr. R. Worrall, seconded by Dr. H. S. Newland and resolved that the statement be adopted.

Correspondence.

Apologies for non-attendance were received from Sir Louis Barnett and Dr. W. N. Robertson.

Arising out of a letter from the President and Honorary Secretary of the honorary staff of the Women's Hospital, Melbourne, it was resolved that the writers be informed that applications from men of recognized character and ability on the staff of the Women's Hospital, Melbourne, or of any other hospital in Australasia would be gladly received and their claims carefully considered by the Council.

A letter from Professor Allen Kanavel, editor of *Surgery, Gynecology and Obstetrics*, was read in which he expressed his best wishes for the future of the College and stated that he was sure that the College had a great future with the men it had to organize it and establish its ideals. It would, in his opinion, be a great power in the profession.

Forms of Application and Certificates.

Forms of application for fellowship, with the pledge, printed forms to be forwarded to persons mentioned as references by applicants and designs for the certificate of registration of fellowship were presented. These as well as a form of endorsement to the certificate to be signed by a newly elected Fellow were approved.

Membership of Council.

In accordance with By-Laws 2 and 3, it was determined by lot that Dr. H. S. Newland, Professor F. P. Sandes, Mr. R. Hamilton Russell and Dr. W. N. Robertson should retire from membership of the Council at the annual meeting, but should be eligible for reelection.

By-Laws and Regulations.

Dr. A. L. Kenny, the Honorary Secretary, presented new by-laws which had been drafted by the solicitor after adoption by the Executive Committee. The by-laws were amended as follows and would be submitted for adoption by the Fellows of the College at the first annual meeting.

Governing Body.

1. The governing body shall be a Council of ten elected Fellows and of such other officers as are appointed by the elected members of the Council under By-Law 6 hereof.

2. The first members of the Council are:—George Adlington Syme, Alexander MacCormick, Louis Edward Barnett, Robert Gordon Craig, Hugh Berchmans Devine, Henry Simpson Newland, William Nathaniel Robertson, Robert Hamilton Russell, Francis Percival Sandes, Ralph Worrall and Augustus Leo Kenny.

3. At the annual general meeting to be held in the year 1928 and at every succeeding annual general meeting one-half of the members of the Council shall retire from office and be eligible for reelection. The members of the Council who shall retire at the annual general meeting in 1928 shall unless the members agree among themselves be determined by lot, but in every subsequent year the members who have held office for two years from the date of their last election shall retire.

Election of Council.

4. Nominations of candidates to fill vacancies upon the Council shall be signed by two Fellows and contain a consent to act, if elected, signed by the persons nominated and shall be left with or forwarded by post to the Honorary Secretary so as to reach him at least forty-two days before the annual meeting.

5. If the number of nominations for the vacancies upon the Council shall not exceed the number of vacancies the persons so nominated shall be declared duly elected at the annual meeting, but if the number of nominations exceeds the vacancies balloting lists shall be printed containing in alphabetical order the names of the candidates nominated and one such list shall thirty days before the annual meeting be forwarded to each Fellow who shall be entitled to vote for as many candidates as there are vacancies to be filled and no more. The candidates up to the number of vacancies who shall receive most votes shall be declared elected and in case of two or more candidates receiving an equal number of votes the President of the College shall have a second or casting vote. Any casual vacancy occurring in the Council through the death or resignation of a member shall be filled by the Council, but any person so chosen shall retain his office so long only as the vacating member would have retained the same if no vacancy had occurred.

Officers.

6. The Council shall appoint the following officers who shall if they are not elected members of the Council be *ex officio* members thereof while they hold office by virtue of their office: A president, two vice-presidents, an honorary secretary and treasurer and a director-general. The respective officers shall hold office for the term of two years and shall exercise the functions of such office after the expiration of such term until a successor shall have been regularly appointed in their stead.

Powers of the Council.

7. The Council shall govern and control all the business of the College and in particular may prescribe and define the duties and functions of the respective officers, adopt rules and regulations for the admission of Fellows and junior members, fix entry fees for Fellowship, create, appoint and direct committees, elect Fellows to the College and appoint auditors and trustees and transact all business not otherwise provided for that may pertain to the College.

8. The Council shall meet for the transaction of business at such times and places as it may from time to time by resolution appoint, or as the President may direct. Five members personally present shall constitute a quorum of Council.

Executive.

9. The Council shall appoint an Executive Committee of the Council consisting of the President, Honorary Secretary and Treasurer and three other members of the Council. A quorum of the Executive Committee shall be such number of its members as the Committee shall by resolution determine.

10. During the intervals between meetings of the Council the Executive Committee shall exercise such powers of the Council in the management and direction of the business and the conduct of the affairs of the College as may be entrusted to it by resolution of the Council or as the President in cases of urgency may decide. The Executive Committee shall keep a record of its proceedings and report the same to the Council at the next succeeding meeting.

State Committees.

11. The Council shall appoint a Committee for each State of the Commonwealth of Australia and for the Dominion of New Zealand selected from the Fellows in such State or Dominion to carry out such duties within such State or Dominion as may be delegated to it by the Council. Each Committee shall appoint a chairman and a secretary. Such committee shall be composed of seven Fellows in New South Wales and in Victoria, six Fellows in the Dominion of New Zealand (three from the North Island, three from the South Island), in Queensland and in South Australia and three Fellows in Western Australia and in Tasmania.

Credentials and Vigilance Committees.

12. The Council shall appoint a credentials committee for each State of the Commonwealth of Australia and for the Dominion of New Zealand to inquire into and report to the Council upon the qualifications of candidates for Fellowship of the College from persons resident in the State or Dominion for which such committee is appointed and to inquire into and report to the Council upon any other matter that may be referred to it by the Council and such committee shall be constituted as follows: The

committee for each of the States of New South Wales, Victoria, and the Dominion of New Zealand shall consist of three Fellows resident in the State or Dominion respectively for which such committee is appointed and the committee for the States of Queensland, South Australia, Western Australia and Tasmania shall consist of two Fellows resident in the State for which such committee is appointed.

13. The Council may appoint vigilance committees in each State of the Commonwealth of Australia and the Dominion of New Zealand with such functions in promoting the interests of the College and supporting and protecting the character, status and interests of the Fellows as the Council shall from time to time limit or determine.

14. All proceedings and reports of credentials committees and of vigilance committees shall be confidential and privileged.

Admission of Fellows.

15. All completed applications for Fellowship of the College shall be sent to the Director-General who shall send them to the credentials committee of the State or Dominion from which the applicant applies. The credentials committee shall report in full for and against each applicant and send this report to the Director-General who shall remit it to the Council for final decision.

16. A candidate for fellowship shall be nominated by three Fellows of the College resident in the State or Dominion in which such candidate resides who are not members of the Council or any credentials committee and the nomination shall be in such form and contain such information and references as the Council may from time to time by regulation prescribe. After February, 1932, the nominators shall have been Fellows for at least five years. Every such nomination shall be signed by the candidate and by his nominators and shall embody the following pledge which shall be binding upon him if admitted to the fellowship:

> I hereby pledge myself as a condition of Fellowship of the College of Surgeons of Australasia which includes New Zealand to practise surgery and to conduct my life in strict accordance with the constitution and principles of the College. I pledge myself to obey all by-laws and regulations of the College now in force, which I hereby declare I have read, and also to obey any other by-laws or regulations that may be adopted from time to time by the College or by its governing body or duly delegated authority. I further declare that I will not practise division of fees either directly or indirectly in any manner whatsoever. I declare that I will submit to any penalties, including expulsion from the College, that may be imposed by the College or the governing body, for violation of any of its by-laws or regulations or of this pledge.

and shall contain an agreement by the candidate that all communications made by the Council or any of the officers or committees and all answers to any *questionnaire* made by any referee or any Fellow of the College shall be absolutely privileged and shall for all purposes be deemed a privileged communication.

17. The Council shall from time to time by regulation prescribe the inquiries which shall be made to verify the statements in a candidate's nomination paper and satisfy itself as to the qualifications of the candidate and after all inquiries have been answered and all relevant data collected as prescribed the Director-General shall forward the candidate's application with all relevant data to the credentials committee of the State or Dominion in which such candidate resides for investigation and report.

18. The credentials committee shall make its report and recommendation to the Council upon the materials transmitted to it by the Director-General and all such facts concerning the candidate as may be in the possession of the individual members of the committee acquired by personal acquaintance and such report shall be made in such manner and contain all such information as the Council shall from time to time prescribe by regulation.

19. The Council shall consider the application, the report and recommendation of the credentials committee thereupon and all relevant materials and communications and may either admit the candidate to Fellowship or reject his application or suspend their final determination for any period it thinks fit or for further proof of the candidate's qualifications. The Council shall not be required to assign any reason for the admission or rejection of a candidate or suspension of its decision upon a candidate's application and the decision of the Council upon any application shall be final and conclusive and subject to no appeal. All proceedings in relation to the election for Fellowship shall be confidential and privileged.

Honorary Fellows.

20. The Council may admit distinguished surgeons or scientists resident outside the Commonwealth of Australia and the Dominion of New Zealand as honorary Fellows of the College and make provision for their admission in such manner as it shall from time to time think fit.

Junior Members.

21. The Council may make regulations prescribing from time to time the qualifications necessary in candidates for junior membership and the steps to be taken by junior members to become applicants for admission as Fellows.

Subscriptions.

22. The annual subscription to be paid by Fellows shall be the sum of five guineas and shall be payable on the first day of February in each year. The annual subscription to be paid by junior members shall be of such amount as the Council may from time to time determine. Fellows admitted during the second half of the year shall pay half of the annual subscription.

Expulsion.

23. A Fellow of the College may be expelled by the vote of a two-third majority of the whole Council at a meeting specially called to consider and deal with the matter of the conduct of such Fellow if the Council is satisfied that he had been guilty of conduct derogatory to the dignity of the College or inconsistent with its purposes or if the Council shall be of opinion that the interests of the College require his expulsion for any other reason then and in such an event such expulsion shall be by unanimous vote. Notice of such meeting and a statement of the charges against him shall be given to the Fellow whose conduct is to be considered and he shall be entitled to attend and show cause why he should not be expelled or to submit an explanation of his conduct in writing. After hearing the Fellow whose conduct is being considered, and reading any written explanation submitted by him or if the Fellow shall not attend such meeting or send any written explanation of his conduct, then after considering the other materials before the Council referring to the conduct of the Fellow charged, the Council shall finally determine the question of expulsion of such Fellow by resolution.

Annual Meeting.

24. An annual meeting of Fellows of the College shall be held at such time and place as the Council shall in each year determine and the business of such annual meeting shall be:

(*a*) To receive the report of the Council;

(*b*) To receive the statement of receipts and expenditure;

(*c*) To consider any proposed alteration of the constitution of which notice shall have been given to the Council not less than six months before the annual meeting;

(*d*) General business;

(*e*) Scientific discussion and practical demonstration of surgical subjects.

25. Thirty days' notice of the annual meeting of Fellows shall be sent to each Fellow at his address for the time being appearing in the register of Fellows and such notice shall set out the full text of any proposed alteration of the constitution. The non-receipt of any such notice shall not invalidate the proceedings at any such annual meeting nor render void any vote of the Fellows properly taken thereat.

Funds.

26. The Honorary Treasurer shall receive all funds of the College and disburse the same by cheque signed by him as such Honorary Treasurer. He shall at each annual meeting of the College furnish a statement of his receipts and disbursements duly audited by such auditors as the Council shall appoint.

State Meetings.

27. The respective State committees shall convene one meeting at the least in each year of the Fellows in their respective States of the Commonwealth of Australia and in the Dominion of New Zealand.

Alteration of By-Laws.

28. These By-Laws shall not be altered or repealed and no new By-Law shall be made save by the vote of a three-fourths majority of the Fellows present and voting at an annual meeting or a special meeting convened for that purpose. Forty-two days' notice of the intention to propose any alteration or repeal of these By-Laws or any new By-Law shall be given to the Honorary Secretary who shall send notice of the same to every Fellow to his address appearing in the register of Fellows at least thirty days before the annual meeting.

The members of the Council expressed their appreciation of the painstaking and excellent drafting of the By-Laws accomplished by Mr. C. J. Ahern, Solicitor, of Melbourne. It was resolved that Mr. Ahern be appointed Honorary Solicitor to the College. The Honorary Secretary was instructed to convey the appreciation of the Council to Mr. Ahern. It was further resolved that the Honorary Solicitor be authorized to redraft and arrange all By-Laws, regulations, resolutions and other documents drawn up by the Council.

In regard to By-Law 11 dealing with State committees it was resolved that the following *inter alia* should be adopted as regulations:

The Fellows in each State of the Commonwealth of Australia or in the Dominion of New Zealand shall send nominations for a committee for their State or for their Dominion.

Candidates' applications fully completed must be in the hands of the Honorary Secretary not later than June 1 or December 1 of each year.

Five references shall be furnished by candidates for fellowship to be all medical, not lay and three at least to be surgeons.

Fellows elected after February, 1930, shall pay an entrance fee of twenty-five guineas which shall go into the Endowment Fund.

Exemptions from payment of the annual subscription in whole or in part may be made by the Council on application in the case of: (*a*) Fellows who subscribe one hundred pounds to the Endowment Fund, (*b*) Fellows who confidentially satisfy the Council that owing to financial conditions the payment of the whole subscription would be a great hardship, (*c*) Fellows who reach the age of sixty-five years or retire from practice. Any Fellow so exempted shall be liable as are all other Fellows to all penalties for violation of the By-Laws or Regulations of the College including expulsion.

Honorary Fellows.

Honorary Fellows shall be nominated and seconded by members of the Council of the College. They shall be surgeons or scientists who have advanced the progress of surgery, not residing in Australasia and recognized as of great eminence in their own country.

It was resolved that His Excellency Sir John Goodwin, F.R.C.S. (England), the Governor of Queensland, be admitted an honorary Fellow of the College. His Excellency was an honorary surgeon to His Majesty the King and had been Director-General of Army Medical Services. It was further resolved that His Excellency be invited to attend the first annual meeting of the College and that His Excellency's convenience be consulted as far as possible in regard to the date.

Annual Meeting.

It was resolved that the first annual meeting of the Fellows of the College be held at Canberra, if possible in the early part of March, 1928.

The Council approved the following programme for the first annual meeting of the Fellows.

Papers:

1. Plastic Surgery of all Parts of the Human Body;
2. History of Colleges of Surgeons.

The Executive Committee was instructed to invite Fellows to submit papers for acceptance and was given power to ask for special papers on the selected subjects from particular Fellows. The Committee was further authorized to obtain anatomical, pathological and other exhibits in connexion with the papers. If necessary payment would be made for the exhibits.

It was resolved that the Governor-General be invited to open the session of the first annual meeting of the Fellows of the College and to be present at the reading of the papers on the history of Colleges of Surgeons.

It was determined that no formal dinner be held in connexion with the first annual meeting.

It was resolved that a discussion on hospital policy be arranged for the first annual meeting by the Executive Committee.

Credentials Committees.

It was resolved that Dr. Reginald Morrison be appointed a member of the Credentials Committee for the State of Victoria in the place of William Moore, deceased. It was further resolved that Dr. A. L. Kenny, Honorary Secretary and Treasurer, be appointed to act temporarily with Sir George Syme as a member of the Credentials Committee in Victoria.

Vigilance Committees.

The Honorary Secretary read the legal opinion obtained from the Solicitor in regard to the appointment of vigilance committees. It was resolved to endorse the recommendation of the Executive Committee that it was not desirable to appoint vigilance committees for the time being.

Solicitors' Opinion as to the Formation of a Vigilance Committee or Vigilance Committees.

The College is advised to follow the practice of the American College of Surgeons: its Board of Regents exercises vigilance. Let the Council of the College do the same.

All of the Fellows on admission to the College of Surgeons of Australasia submit to the jurisdiction of the Council. It is for the Council to determine how the College shall be governed and one of the matters for such determination is the good conduct of Fellows of the College.

The Council should deal with vigilance matters. There would be much less objection to its action than there would be to the action of subordinate committees.

It would be possible to appoint vigilance committees in each State of the Commonwealth of Australia and in the Dominion of New Zealand to report infractions of the By-Laws and to make charges before the Council.

The mere fact of membership of the Council would not preclude a member of the Council from acting judicially with the Council against the Fellow charged before the Council. Of course, one must not depart from the principles of natural justice.

It was decided to advise the Council that it was not desirable to form vigilance committees at present.

Annual Meetings in Each State.

It was resolved that it be a regulation that a scientific meeting be held in each State annually six months after the annual meeting, excepting in the State in which the annual meeting had last been held.

Journal of the College of Surgeons.

It was resolved that the Council affirm the principle of establishing a journal to be called *The Journal of the College of Surgeons of Australasia*, to be published at such times and to contain such matters as the Executive Committee may determine.

Higher Degrees in Surgery.

It was resolved that the following recommendation be sent to the advisory committees of the several universities for higher degrees in surgery:

That the examination for the higher degrees in surgery be in two parts:

Part I.—Anatomy and physiology,

Part II.—Surgery and surgical pathology.

Candidates may not present themselves in Part I unless they have graduated.

Propaganda.

It was resolved that an article be written on the College of Surgeons of Australasia for publication in the lay press, after the approval of the writers of the articles on the history of Colleges of Surgeons and that Sir George Syme be delegated to write the article.

The Honorary Secretary was authorized to write to Sir John Butters, the Chairman of the Federal Capital Commission, accepting the preliminary proposal in regard to a site for the College at Canberra.

The Executive Committee was asked to make the necessary inquiries in regard to the acquisition of a motto, a coat of arms, a crest and a seal.

The Fellows were to be urged to use the title "Mr." instead of "Dr." A notice to this effect would be published in the first number of the journal.

Applications for Admission to Fellowship.

A number of applications for admission to fellowship had been received by the Honorary Secretary. The necessary replies from the sponsors had not been received in time to have the applications forwarded to the Credentials Committees before the meeting of the Council. The President had ruled in accordance with the By-Laws that the applications could not be dealt with by the Council at that meeting.

It was resolved that as a communication had been received from the Founders of the College in New South Wales, nominating Dr. N. D. Royle a Foundation Fellow, he be informed that he had been appointed a Foundation Fellow.

The Council appointed the following Fellows to act as a committee in their respective States of the Commonwealth of Australia and in the Dominion of New Zealand to carry out such duties as may be delegated to them by the Council in accordance with By-Law 6. These appointments would remain effective until the first annual meeting.

New South Wales.—Archie Aspinall, C. E. Corlette, R. Gordon Craig, H. R. G. Poate, F. P. Sandes, R. B. Wade, R. Worrall.

Victoria.—H. B. Devine, R. M. Downes, V. Hurley, Fay Maclure, Allan Newton, E. R. White, B. T. Zwar.

South Australia.—J. Corbin, H. Gilbert, R. H. Pulleine, Malcolm L. Scott, Bronte Smeaton, T. G. Wilson.

Queensland.—E. D. Ahern, G. P. Dixon, E. S. Jackson, Æneas McDonnell, J. B. McLean, R. A. Meek.

Western Australia.—T. Ambrose, F. A. Hadley, D. D. Paton.

Tasmania.—D. H. E. Lines, J. Ramsay, H. W. Sweetnam.

New Zealand.—(List to be arranged by the Executive Committee.)

It was resolved that no applicant engaged in general practice in a capital city should be eligible for election as a Fellow.

Australasian Medical Publishing Company, Limited.

ANNUAL MEETING.

The annual meeting of the Australasian Medical Publishing Company, Limited, was held at The Printing House, Seamer Street, Glebe, New South Wales, on September 28, 1927.

Directors' Report.

The acting Chairman, Dr. Gregory Sprott, presented the report of the Directors as follows:

The Directors submit their report for the past year and balance sheet as at June 30, 1927, together with profit and loss account for the twelve months ended June 30, 1927.

During the year the growth of the Company's business as general printers was continuous, until the staff and the machines became overstrained. The appointment of an Assistant Manager and for some time of a special overtime staff served to meet the situation, pending the installation of additional plant. The new plant, consisting of a monotype and a printing press with their necessary appurtenances, is now being erected and is expected to be in operation in October and the working staff is being engaged. It is anticipated that it will shortly be practicable to proceed with the production of the Popular Health Magazine and the issue of the Medical Directory, both of which have been for some time in contemplation.

The Medical Journal of Australia completed its thirteenth year at June 30, 1927. It has continued its usefulness to the profession in Australia and has maintained its high position among the medical journals of the world. As in the case of the Australasian Medical Congress (British Medical Association), first session, held in Melbourne in 1923, its pages have been availed of for the publication of the Transactions of the second session, 1927, held in Dunedin. As before, the Transactions appear as a supplement to the Journal.

It is to be noted that the publication of the *Australasian Nurses' Journal*, which has appeared as a monthly journal for many years, has now been taken over by the Company. The Company is also at the present time publishing a considerable number of scientific journals and periodicals.

The first medical work to be printed and published by the Company, namely "Hydatid Disease," by Harold R. Dew, M.B., B.S. (Melb.), F.R.C.S., Eng., has already been brought to the notice of the medical profession and will shortly be ready.

Dr. Gregory Sprott and Dr. the Honourable A. J. H. Saw, M.L.C., retire from the Board of Directors in accordance with the Articles of Association and are eligible and offer themselves for reelection.

For the financial position of the Company the members are referred to the balance sheet and profit and loss account.

(Signed) GREGORY SPROTT,
Acting Chairman.

Election of Directors.

On the recommendation of the Directors it was resolved to increase the number of Directors from six to seven.

Dr. Gregory Sprott and the Honourable A. J. H. Saw were reelected to the Board of Directors. Dr. George Armstrong was elected a Director in accordance with the resolution referred to above.

Public Health.

THE HEALTH OF SCHOOL CHILDREN IN VICTORIA.

The report of the Minister of Public Instruction in Victoria for the year 1925-1926 has recently been issued. In this important document there is a large amount of

information of concern to the medical profession and to the public. Unfortunately this kind of information rarely receives much attention and still less frequently is it made the subject for discussion. The Minister points out that the number of children attending the elementary State schools increased from 217,858 to 220,295, that of children attending the intermediate State schools increased from 14,029 to 15,919 and that of children attending the secondary State schools increased from 7,437 to 8,042. The increase of children attending registered schools was 570. He estimates that the total number of children at school during the year 1925 was 301,413. The number of teachers at these schools was 7,241.

Under the caption of special schools it is stated that satisfactory progress is being made at the schools for the blind and deaf and dumb and that the children at the schools for epileptics at Clayton and at the open air school at Blackburn are improving in physical health and in consequence in mental development. The Minister gives a hopeful report on the work at the schools for the feeble-minded at Fitzroy and at Montague and at the schools attached to the penal establishment at Pentridge and at the Castlemaine Reformatory.

It is further pointed out that 14,000 children learned to swim during the year.

Five lines are devoted to the subject of the medical inspection of school children. These lines convey the important information that the staff of medical officers has been increased from four to eight and that the staff of dental officers has been increased from two to five. There are in addition four part-time medical officers, five dental attendants, two school nurses and two school disinfectors.

Psychological Teaching at the Teachers' College.

There is a psychological laboratory at the Teachers' College at Melbourne. Lectures and experimental work are provided. A considerable amount of original work is being conducted. Dr. C. McRae, the head of the laboratory, in association with Professor R. J. A. Berry, continued the work of testing the intelligence of delinquent children at the Children's Welfare Department, Royal Park. This institution is under the care of Dr. A. P. Derham, who has given the necessary information concerning the physical condition of the inmates. Dr. McRae records the results of physical, psycho-physical, mental and scholastic tests, the mechanical ability, the assessment of the child's temperament, sentiment, interests, motives and character and makes recommendations in regard to each child tested.

Medical Inspection.

Dr. Jane S. Greig is allowed four and a half pages in which to deal with all the matters arising out of the year's work in her department. She points out that during the year under consideration she was a member of the Royal Commission on Health. This position gave her an opportunity of examining at first hand the methods and practice adopted in medical inspection of school children throughout the Commonwealth. That her experience has been a valuable one is evident.

During the year the total number of children examined was 48,648. Of these 25,521 were boys and 23,127 were girls. In addition there were forty-nine children examined for special reasons, such as truancy. The total number of teachers examined was 1,446, of whom 987 were female. The salaries of the eight school medical officers, five dentists, six dental attendants and two school nurses (twenty-one persons) was £8,886.

The headquarters staff undertakes all the administrative work. Its members lecture at the University, Teachers' College, Domestic Economy College and at the swimming schools. They conduct all the examinations of teachers for appointment to the Public Service, those applying for sick leave or for superannuation and all high school students. The country staff is given the task of examining the children in the schools in the country. This work is so arranged that the whole State is covered each three years.

The high schools are visited every two years. This enables the medical officers to examine those who wish to join as junior teachers. If any defects are found, the individual has time to have them remedied before he or she joins the service.

The medical officers pay attention to the general welfare of the children. Many dirty and neglected children owe their condition to poverty, illness or other social exigencies of the home. The remedy is sought in collaboration with public and voluntary agencies. At the schools for the deaf and dumb and for the blind the examination has proved of great value. Dr. Greig also points out that the officers of the service have done useful work at the schools for epileptics by controlling the teeth and removing possible exciting causes of fits. At some of the institutions visited epidemics of scabies and of ophthalmia have been encountered.

She reports that the standard of cleanliness at the greater number of the institutions is not unsatisfactory. On the other hand she finds that the dietary at these places is below the physiological requirements of the children. The children are often given a diet consisting largely of carbohydrate. Meat, milk, vegetables and fruit are given sparingly, if at all. The medical examination of the children in these institutions has revealed that, while they are of average height and weight, or even above the average, they are of a heavy, stolid type and lack mental and physical alertness, characteristic of healthy, happy children. These matters are being taken up by the Charities Board.

Dental Treatment.

There is a School Dental Centre, comprising an office, two dental surgeries, a waiting room and an attendant's room. Three dentists and four attendants are employed. There is also a travelling dental clinic contained in a motor van and one dentist with his attendant moves his clinic from place to place in the country. The primary object of the dental clinics is to be educational and prophylactic, but a certain amount of treatment has to be carried out. Mechanical cleansing of the teeth is regarded as of great importance.

School Nurses.

The chief activity of the two school nurses is in the direction of what is known as "following up." When the medical officer notifies the parents that the child has a defect demanding treatment, the nurse endeavours to persuade the parents to obtain the necessary treatment. In outlying country districts the bush nurses lend their aid in the work. It is estimated that the result of the nurses' visits has been to increase the number of children treated to nearly 90%. At times 95% of children with defects obtain medical or dental treatment either in private or at a hospital.

General Effects of Inspection.

The evidence that the medical inspection of school children in Victoria has been of value is convincing. In 1909 practically one half of the girls examined had *pediculosis capitis*. In 1925 *pediculi* were discovered in only 12·4% of the girls' heads. Approximately 4% of the children wear glasses as a result of advice given on discovery of visual defects; nearly 50% have dental treatment; nearly 28% had received treatment for nose and throat defects. Deafness and otorrhœa are rare. It is also interesting to learn that serious deformities, such as congenital dislocations and *talipes*, are relatively uncommon. The chief cause of crippling is poliomyelitis.

Reference is made by Dr. Greig to the frequency of endemic goitre in Gippsland. Prophylactic treatment was undertaken by the Public Health Department of Victoria for a short period, but had been discontinued. The Commonwealth Health Department invited the medical officers to keep records of all tuberculous lesions discovered in children. The total record was two children with tuberculous glands, five children with probable tuberculosis of the lungs. Seven thousand children were examined. In none was joint tuberculosis discovered.

Infective Disease.

It was ascertained that approximately 70% of the children in the metropolitan area had morbilli before they entered school. The maximum incidence was reached at the age of seven. In the rural districts only 40% of the children had measles before entering school. The maximum incidence was reached at the age of seven.

About 45% of the children both in the city and in the country had pertussis before entering school. The maximum incidence of this disease was about the age of seven.

But few children had diphtheria before entering school. The incidence of the disease increases to the age of fourteen and reaches 15%. We are surprised to learn that very few children had scarlet fever before entering school. The highest incidence is between the ages of five and nine years. The incidence, however, is relatively low. Dr. Greig deduces from these ascertained facts that the prophylactic measures against diphtheria and scarlet fever are of the greatest importance as far as school children are concerned. She hopes that the Schick and the Dick tests will be applied throughout the State, in order that susceptible children may be immunized.

Defects.

The number of children attending the district high schools examined was 5,140. Of these 6·6% had visual defects, 3% had defects of hearing, 8·9% had defects of nose and throat, 44·2% had dental defects, while 0·2% had heart affections, 1·7% had anæmia, 0·8% had skin affections and 3·6% had other defects. In the children attending elementary and technical schools, numbering 26,003 boys and 22,674 girls, 3·6% of the boys and 5·7% of the girls had visual defects, 1·7% of the boys and 2·7% of the girls had defects of hearing, 12·5% of the boys and 10·5% of the girls had defects of the nose and throat, 41·1% of the boys and 53·1% of the girls had dental defects, 0·9% of the boys and 0·7% of the girls had heart affects, 0·9% of the boys and 0·7% of the girls had skin diseases, 0·9% of the boys and 13·7% of the girls had hair defects and 0·4% of the boys and 0·9% of the girls had anæmia.

At the elementary schools 33,449 children were examined. As a result of the examination the parents of 11,791 children were notified that a medical defect had been discovered which should be treated. Treatment was obtained in the case of 29·6% of the children. In regard to dental defects action was taken in connexion with 45% of the children. Better results were obtained at the technical schools and at the high schools. Dr. Jane S. Greig is to be congratulated on the development of her department and on the amount of highly valuable work that has been carried out. We trust that in next year's report the Minister will be more generous and invite Dr. Greig to give a fuller account of the work.

VENEREAL DISEASE IN NEW SOUTH WALES.

It is unfortunate that the wheels of officialdom revolve with such deliberate sloth. The activities of a governmental department must be judged chiefly from its reports. It is therefore advisable that these documents should be full and candid. When the light of criticism is shed on the record of work carried out, defects may be discovered, remedies suggested and encouragement given for the future. The honest and conscientious officer does not fear criticism; he welcomes it. He does not know all that there is to know about his subject; if he is allowed to remain ignored in his official rut, he may imagine that he is omniscient and it is surely true that self-satisfaction and self-adulation are among the soul-destroying sins. When a departmental officer issues his report, it is in the public interest that that report shall be circulated as soon as possible. The official wheels have to be set in motion. This is evidently a tedious business. The Director-General of Health of New South Wales made his report for the year ended December 31, 1925. It was "printed under Number 1 Report from Printing Committee" on December 23, 1926. Finally on publication the document bears the date 1927. A copy of the report reached the office of this journal on June 7, 1927. A long and weary journey! Our sympathies are entirely with the Director-General. He would not be human if he were not discouraged. It would almost appear that the Government regards these documents as of no importance. It is not alone, however, in the printing of reports that the Government offers discouragement to its medical officers.

Embodied in the report of the Director-General of Health is the report of the Commissioner administering the *Venereal Diseases Act*, 1918. This is the fifth report issued in connexion with this Act. Dr. Robert Dick points out that the total number of cases notified under the Act during 1925 was 5,314. This number is 776 less than it was in 1924. In 1925 the notification comprised 1,015 cases of syphilis; male patients numbered 762 and female 253. Cases of gonorrhœa which were notified, numbered 3,933 and of the affected persons 3,584 were males and 349 were females. Other forms of venereal disease accounted for 366 cases. The proportion of males to females suffering from gonorrhœa and syphilis respectively was 10·27 to 1 for gonorrhœa and 3 to 1 for syphilis. These ratios have remained practically unaltered for several years. The disparity in the incidence of gonorrhœa in females is held by Dr. Dick to correspond to the experience in other countries where notification is not in force.

A table is given setting out the number of notifications made for each of five years. Some interesting facts may be discovered by a study of this table. In 1921 the number of cases reported was 9,405. In 1925 it was, as stated above, 5,314. In 1921 the number of persons reported for failure to continue treatment was 2,472. In 1925 the number was 955. Reduced to percentages these numbers are approximately 26% and 18%. This must be regarded as satisfactory. The improvement is in all probability due to keener appreciation on the part of affected persons of the value of treatment. The same satisfaction cannot be claimed when the results of efforts to make these persons resume treatment are considered. A total of 1,286 letters was returned undelivered when sent to the 2,472 persons in 1921; 906 resumed treatment and the number of cases not finalized at the end of the year was 280. Apparently the term "not finalized" applied to a case means that it is still under consideration. In 1925 letters were returned undelivered to the number of 538 when sent to the 955 persons and the number of cases not finalized was 176. It is to be noted that during 1925 action was taken against a girl, eighteen years of age, for failing to place herself under treatment when she was suffering from venereal disease. It cannot be concluded that this girl was the only one whose case could not be "finalized" in a satisfactory manner. The question may reasonably be asked as to why this child (she is little more than a child) was chosen for departmental vengeance. No other conclusion is possible than that the Commissioner's hands are tied by ministerial restrictions placed upon him. This is possibly the reason why the Commissioner does not discuss the significance of his own figures.

In 1924 notifications were received from 341 medical practitioners, while in 1925 notifying medical practitioners numbered only 298. In 1925 there were in New South Wales 1920 medical practitioners and the great majority of these were general practitioners or specialists whose group of patients would be likely to include prsons suffering from venereal disease. We do not believe that the number of medical practitioners who do not see a patient with venereal disease from one year's end to the other, is as large as these figures indicate. Medical practitioners are neglecting their duty in this regard because they know that the provisions of the Act are not being enforced.

The casual reader of this report might possibly think that the venereal outlook is bright in New South Wales, but this survey of the figures given reveals that reform is at a standstill. The Commissioner puts in a plea for the adoption of useful measures, such as the routine performance of the Wassermann test in antenatal clinics. He also asks for the granting of the subsidy from the Commonwealth which was recommended by the Royal Commission on Health. Good would undoubtedly result from such steps as these, but they will be of little real assistance until the Act is enforced, until Parliament is not afraid to offend the venereally elect.

Correspondence.

DIATHERMY.

SIR: I am supplementing your correspondent's timely letter of assurance in your issue of October 1 mentioning that the possibility of being electrocuted with high frequency diathermy current is remote. It is not only remote, it is impossible. In every instance of electrocution there has been present another low frequency current. Your correspondent rightly observes that the usual case is where a person earthed receives the low frequency service main current because the high frequency terminal may have a direct connexion to the mains, as is the case in most of the small violet ray machines. But he omitted to mention the case where there is no question of being earthed, such being the unfortunate instance at Armidale. The doctor was abed and was charged sufficiently with the high frequency current to cause a spark to jump from his ear to the telephone diaphragm. The high frequency terminal on his abdomen with a very efficient conductor in the blood stream the thirty volts of the telephone current had little resistance to overcome in reaching his heart. To pick up a radiator with the current flowing through it while charged with a high frequency current and standing on an insulated floor would have the same effect. The ordinary 220 volt insulation would prove quite inadequate against the high frequency. Ordinary insulation is useless as regards high frequency and there is nothing to prevent the full rush of the mains once this insulation is broken down.

Yours, etc.,

"SECONDARY CURRENT."

October 4, 1927.

POST-GRADUATE STUDY.

SIR: Dr. Kenneth Smith brings forward a practical suggestion. Post-graduate lectures at such a neutral hour as 5 to 6 p.m. might fill a real need of metropolitan practitioners. There is also the country doctor to consider, less fortunately placed for keeping in touch with his old hospital which once issued him with a student's life ticket and since has not troubled about him.

Post-graduate lectures are needed of two kinds; a series of general refresher courses and a series of demonstrations on special subjects. Intensive courses on the latter might suit well the requirements of busy and distant practitioners.

It would be admirable if certain indoor and outdoor clinics at metropolitan hospitals were recognized as for post-graduate study only, other students being excluded. Both the standard and the usefulness of the work done would thereby be raised.

It must be admitted that though the causes of undergraduate instruction and attendance on the sick poor are well served in our chief capitals, our contributions to clinical medicine and surgery are few. Perhaps the stimulus of post-graduate teaching would remove this reproach.

Yours, etc.,

ALLAN S. WALKER.

141, Macquarie Street, Sydney.
September 27, 1927.

ELECTRICAL ACCIDENTS.

SIR: Among the recommendations in the able paper of Dr. Bede J. Harrison is:

"4. That a box of suitable equipment, including oxygen-carbon dioxide inhaler, such as that mentioned, be kept at all power houses and substations."

It is now fairly well known that "10-90" or other mixture of carbon dioxide and oxygen stimulates the respiratory centre and causes deep breathing. But those who have worked with cylinders of these mixtures, know their limitations. To be of any use they must be large and so are heavy and clumsy, the valves will not always open easily or else have been imperfectly shut off and the cylinder is empty.

Carbon dioxide alone will cause the stimulation and the oxygen may be taken in from the air. There is a very simple apparatus made by Sparklets Limited and fully described by Dr. H. Whitridge Davies in Volume IV, No. 3 of *The British Journal of Anæsthesia*.

The stock "J" size Sparklet bulbs are used and the whole apparatus measures $10 \times 3\frac{1}{4} \times 1$ inch. The bulbs contain twenty-five grammes of liquid carbon dioxide which provides approximately twelve litres of gas. This with a maximum rate of flow of two litres per minute would last for a period of at least six minutes.

As the bulb is only punctured when required there is no risk of lack of gas and the refills only measure $6\frac{1}{4} \times \frac{3}{4}$ inch approximately.

The apparatus and refills are easily carried in the anæsthetic bag.

This cheap and simple aid to resuscitation might well be supplied to workshops, tower waggons, and the linesman's kit as well as power houses and substations.

Yours, etc.,

GILBERT BROWN.

Verco Buildings,
North Terrace, Adelaide.
September 26, 1927.

Post-Graduate Work.

THE NOVEMBER COURSE IN MELBOURNE.

The Melbourne Permanent Committee for Post-graduate Work will hold its November refresher course in Melbourne from November 7 to November 19, 1927. Further information will be published at a later date.

In response to several requests the Committee has made arrangements in order that country and interstate graduates attending the November course may go into residence at the Alfred Hospital, the Melbourne Hospital, Saint Vincent's Hospital and the Women's Hospital. It is hoped that similar arrangements will be made for residence at the Children's Hospital. Members residing in these hospitals will have access to all the activities of the institutions day and night. There will be an extra fee of three guineas per week for board. Members wishing to take advantage of these arrangements are requested to communicate with the Honorary Secretaries, Dr. J. W. Dunbar Hooper and Dr. Harold Dew, 12, Collins Street, Melbourne, before October 31. They should state the order of preference of the hospitals at which they wish to reside, as the accommodation at each is limited. Allocation will be made in order of application.

Tutorial Classes in Anatomy and Pathology.

The Melbourne Permanent Committee for Post-graduate Work in response to several requests has arranged the following tutorial classes in anatomy and pathology. These are primarily intended for prospective candidates for the M.S. examination in March, 1928, and will be held if six or more graduates indicate their intention to attend.

They will be held on this occasion during the months of December, January and February at the Walter and Eliza Hall Institute, Melbourne Hospital. They will comprise the following:

Mr. A. E. Coates, M.S.—Twenty lecture-demonstrations in anatomy of bones and joints.

Mr. Henry Searby, F.R.C.S.—Twenty lecture-demonstrations in regional anatomy.

Mr. C. J. O. Brown, F.R.C.S.—Twenty-five lecture demonstrations in surgical pathology.

The fee for the whole course is twenty guineas. A detailed time-table will be issued later.

Intending members are asked to communicate with the Honorary Secretaries before October 31, 1927.

Naval and Military.

APPOINTMENTS.

The undermentioned appointments, changes *et cetera* haev been promulgated in the *Commonwealth of Australia Gazette*, Numbers 94 and 103, of September 8 and 29, 1927.

Permanent Naval Forces of the Commonwealth. (Seagoing Forces.)

Appointments.—Henry Woodall Gault, M.B., B.S., is appointed Surgeon Lieutenant (on probation), dated 15th August, 1927.

Australian Military Forces.

First Military District.

Australian Army Medical Corps.

The provisional appointments of Captains M. L. D. McKeon, G. H. Brandis, and O. E. J. Murphy are confirmed.

Australian Army Medical Corps Reserve.

Lieutenant A. F. Janes is transferred from the Australian Army Medical Corps Reserve, 2nd Military District, 12th August, 1927.

Captains C. R. R. Huxtable, M.C., and E. W. F. Dolman are transferred from the Australian Army Medical Corps Reserve, 2nd Military District, 1st September, 1927. Major A. J. MacDonald, V.D., is placed upon the Retired List with permission to retain his rank and wear the prescribed uniform, 1st October, 1927.

Retired List.

Captain W. M. Sinclair is transferred from the Australian Army Medical Corps Reserve, 2nd Military District, and is placed upon the Retired List with permission to retain his rank and wear the prescribed uniform, 12th August, 1927.

Second Military District.

Australian Army Medical Corps.

Lieutenant-Colonel B. C. Kennedy is brought on the authorized establishment of Lieutenant-Colonels, 1st July, 1927; Majors A. J. Mollison and W. T. Newton are brought on the authorized establishment of Majors, 1st July, 1927.

Captain (provisionally) J. Hughes is brought on the authorized establishment, 15th July, 1927. Captain (provisionally) A. B. Barry and Lieutenant (provisionally) K. C. T. Rawle are brought on the authorized establishment, 1st September, 1927.

Award of the Colonial Auxiliary Forces Officers' Decoration.

Australian Army Medical Corps.—Colonel F. A. Maguire, D.S.O.

Third Military District.

Australian Army Medical Corps.

Captain R. Hylton is seconded whilst attending a post-graduate course abroad, 20th August, 1927.

Australian Army Medical Corps Reserve.

Honorary Captain E. A. Strahan is retired, 9th September, 1927.

Fifth Military District.

Australian Army Medical Corps Reserve.

Honorary Captain W. H. Rigby is retired, 16th September, 1927.

Sixth Military District.

Australian Army Medical Corps.

Major R. M. W. Webster, M.C., is brought on the authorized establishment of Majors, 1st July, 1927.

Proceedings of the Australian Medical Boards.

NEW SOUTH WALES.

The undermentioned have been registered under the provisions of *The Medical Act*, 1912 and 1915, of New South Wales, as duly qualified medical practitioners.

Arnold, William John, M.B., 1927 (Univ. Sydney), 255, Homer Street, Earlwood.
Bellingham, Francis Arthur, M.B., 1927 (Univ. Sydney), 94, Cabramatta Road, Cremorne.
Benz, Gladys Dulcie Carrie, M.B., 1927 (Univ. Sydney), 327, Marrickville Road, Marrickville.
Blackall, Moya Kathleen, M.B., 1927 (Univ. Sydney), Killard, Queanbeyan.
Bohrsman, Gustav Temple Hall, M.B., 1927 (Univ. Sydney), Coo-ee, Enmore Road, Enmore.
Brodziak, Innes Albert, M.B., 1927 (Univ. Sydney), Barncleuth Square, Elizabeth Bay.
Bull, Ignatius Loyola, M.B., 1927 (Univ. Sydney), 100, Lang Road, Centennial Park.
Canny, Alan Joseph, M.B., 1927 (Univ. Sydney), Box 1603, G.P.O., Sydney.
Chenhall, Frederick Nicholas, M.B., 1927 (Univ. Sydney), 31, Nelson Street, Woollahra.
Cronin, Mary Josephine, M.B., 1927 (Univ. Sydney), Wallis Parade, Bondi.
Ducker, Alan Lyall, M.B., 1927 (Univ. Sydney), Phillip Street, Neutral Bay.
English, Peter Bede, M.B., 1927 (Univ. Sydney), 57, Carr Street, Coogee.
Geikie, Gertrude Cameron, M.B., 1927 (Univ. Sydney), Thomas Street, Gordon.
Hardy, Marie Naomi, M.B., 1927 (Univ. Sydney), Maitland Street, Narrabri.
Holt, Walter Gerald, M.B., 1927 (Univ. Sydney), 3, Tusculum Street, Potts Point.
Lawrie, Charles Malcolm, M.B., 1927 (Univ. Sydney), c.o. Miss Lawrie, Braeside Private Hospital, Stanmore.
Lewis, David Herbert, M.B., 1927 (Univ. Sydney), Wesley College, Newtown.
Magill, William Louis, M.B., 1927 (Univ. Sydney), Chelmsford Avenue, Haberfield.
Maher, Adrian Odillo, M.B., 1927 (Univ. Sydney), Wolseley Road, Point Piper.
Mayes, Bruce T'oomba, M.B., 1927 (Univ. Sydney), Saint Andrew's College, Newtown.
Millar, David Fitzroy, M.B., 1927 (Univ. Sydney), 47, Hale Road, Mosman.
Morrow, Arthur William, M.B., 1927 (Univ. Sydney), 14, Sloane Street, Summer Hill.
Murray, Ronald Elliott, M.B., 1927 (Univ. Sydney), 51, Marian Street, Auburn.
Newton, William Neild, M.B., 1927 (Univ. Sydney), South Parade, Campsie.
O'Brien, John, M.B., 1927 (Univ. Sydney), 8, Leeton Avenue, Coogee.
Platt, Albert Edward, M.B., 1927 (Univ. Sydney), 8, Leeton Avenue, Coogee.
Rau, Noel, M.B., 1927 (Univ. Sydney), 67, Birriga Road, Bellevue Hill.
Redshaw, George Muir, M.B., 1927 (Univ. Sydney), Beecroft Road, Cheltenham.
Ross, Garnet Andrew, M.B., 1927 (Univ. Sydney), 168, Newland Street, Waverley.
Russell, Gerald, M.B., 1927 (Univ. Sydney), Post Office, Cronulla.
Rutherford, Laurence Osborne, M.B., 1927 (Univ. Sydney), Wentworth Street, Point Piper.
Smith, William Frederick, M.B., 1927 (Univ. Sydney), Queensland Hotel, Erskine Street, Sydney.

Steele, Frederick George, M.B., 1927 (Univ. Sydney), 7, Zara Road, Willoughby.
Stening, George Grafton Lees, M.B., 1927 (Univ. Sydney), 247, Bondi Road, Bondi.
Telfer, Archibald Craig, M.B., 1927 (Univ. Sydney), 41, Moruben Road, Mosman.
Ternes, Alfred Christopher, M.B., 1927 (Univ. Sydney). 59, Clarendon Road, Stanmore.
Vout, Lawrence, M.B., 1927 (Univ. Sydney), 16, Abbotsford Road, Homebush.
Walker, Milner Frederick Elford, M.B., 1927 (Univ. Sydney, 12A, Karori Flats, Elizabeth Bay.
Whittemore, John Bede, M.B., 1927 (Univ. Sydney), 86, Connemara Street, Kogarah.
Williams, Frederick James, M.B., B.S., 1921 (Univ. Melbourne), Lidcombe State Hospital and Home.
Williams, Morris Albert, M.B., 1927 (Univ. Sydney), Wesley College, Newtown.
Wing, Lindon Worlledge, M.B., 1927 (Univ. Sydney), Coonanbarra Road, Wahroonga.

VICTORIA.

THE undermentioned have been registered under the provisions of Part I of *The Medical Act*, 1915, of Victoria, as duly qualified medical practitioners.

Body, Harold Alfred, M.B., B.S. (Univ. Melbourne), 237, Glenhuntly Road, Elsternwick.
Bothroyd, John Strahan, M.B., B.S., 1927 (Univ. Melbourne), 8, Carnarvon Road, Caulfield.
Box, William Mitchell, M.B., B.S., 1927 (Univ. Melbourne), 286, Union Road, Surrey Hills
Buchanan, Andrew Russell, M.B., B.S., 1927 (Univ. Melbourne), 7, Hopetoun Road, Malvern.
Cantor, Cecil Nathaniel Love, M.B., B.S., 1927 (Univ. Melbourne), 329, Glenferrie Road, Malvern.
Costigan, Francis Eugene, M.B., B.S., 1927 (Univ. Melbourne), Gower Street, Preston.
Dodd, Norman Laidman, M.B., B.S., 1927 (Univ. Melbourne), 276, Cotham Road, Kew.
Eddie, Theodore Stirling, M.B., B.S., 1927 (Univ. Melbourne), Balgownie, Winchelsea.
Enniss, Harley John, M.B., B.S., 1927 (Univ. Melbourne), 11, Aird Street, Camberwell.
Fairley, Ronald Adrian, M.B., B.S., 1927 (Univ. Melbourne), 225, Burke Road, Canterbury.
Fox, Raymond William Sydney, M.B., B.S., 1927 (Univ. Melbourne), 383, Wattle Tree Road. East Malvern.
Frank, Theophil Johannes Friedrich, M.B., B.S., 1927 (Univ. Melbourne), 22, Gisborne Street, East Melbourne.
Gilroy, Alan Brownlie, M.B., B.S., 1927 (Univ. Melbourne), Bank of Australasia, Prahran.
Gowenlock, David Evans, M.B., B.S., 1927 (Univ. Melbourne), 241, Glenhuntly Road, Elsternwick.
Grieve, Edward James, M.B., B.S., 1927 (Univ. Melbourne), 194, Osborne Street, Williamstown.
Hanrahan, Henry John Chadwick, M.B., B.S., 1927 (Univ. Melbourne), High Street, St. Kilda.
Harrington, Norrie Nelson, M.B., B.S., 1927 (Univ. Melbourne), Commercial Bank, Northcote.
Hill, Arthur Machen, M.B., B.S., 1927 (Univ. Melbourne), 297, Glenferrie Road, Malvern.
Jones, Basil Owen, M.B., B.S., 1927 (Univ. Melbourne), 17, Wendouree Parade, Ballarat.
Jones, Paul, M.B., B.S., 1927 (Univ. Melbourne), Bull Street, Bendigo.
Juttner, Frank James Alexander, M.B., B.S., 1927 (Univ. Melbourne), "Paranook," Tanunda, South Australia.
Keogh, Esmond Venner, M.B., B.S., 1927 (Univ. Melbourne), 361, Church Street, Richmond.
Keon-Cohen, Bryan Tobyn, M.B., B.S., 1927 (Univ. Melbourne), 106, Vale Street, East Melbourne.
Knight, Glen Albyn Martin, M.B., B.S., 1927 (Univ. Melbourne), 780, Malvern Road, Armadale.
Martin, Hugh Henry, M.B., B.S., 1927 (Univ. Melbourne), Eldorado Park, Chiltern.
Melville, Charles Bernays, M.B., B.S., 1927 (Univ. Melbourne), 311, Royal Parade, Parkville.
Mushin, Maccabee, M.B., B.S., 1927 (Univ. Melbourne), 806, Lygon Street, North Carlton.
McGinn, Keith Edward, M.B., B.S., 1927 (Univ. Melbourne), 93, Campbell Street, Kalgoorlie, Western Australia.
Osborn, Gladstone Rule, M.B., B.S., 1927 (Univ. Melbourne), Orrong Court, Orrong Road, East St. Kilda.
Phillips, Henry Anthony, M.B., B.S., 1927 (Univ. Melbourne), 24, Moorehouse Street, East Camberwell.
Phillips, Lewis Leon, M.B., B.S., 1927 (Univ. Melbourne), 98, Wattle Tree Road, Malvern.
Price, Eric Evan, M.B., B.S., 1927 (Univ. Melbourne), 415, Glen Eira Road, Caulfield.
Rabinov, Louis, M.B., B.S., 1927 (Univ. Melbourne), 77, Crockford Street, Port Melbourne.
Rawlings, William Joseph, M.B., B.S., 1927 (Univ. Melbourne), 17, Stanley Street, East Brunswick.
Robertson, Edward Graham, M.B., B.S., 1927 (Univ. Melbourne), 8, Geelong Road, Footscray.
Scott, Rutherford Kaye, M.B., B.S., 1927 (Univ. Melbourne), 250, High Street, Prahran.
Sherman, John Burrowes, M.B., B.S., 1927 (Univ. Melbourne), Commercial Bank, Unley.
Worcester, Reginald George, M.B., B.S., 1927 (Univ. Molbeurne), 13 Clarinda Street, Essendon.

Obituary.

CHARLES HERBERT HILL.

We regret to announce the death of Dr. Charles Herbert Hill which occurred at Robe, South Australia, on October 4, 1927.

GERALD THOMAS MORONY.

We announce with regret the death of Dr. Gerald Thomas Morony which occurred at Sydney on October 6, 1927.

TRANSACTIONS OF CONGRESS.

OWING to unusual congestion of work in The Printing House it has been necessary to postpone the publication of the tenth supplement containing Transactions of the Australasian Medical Congress (British Medical Association), Dunedin, 1927, second session, for a fortnight. The tenth supplement will be issued with THE MEDICAL JOURNAL OF AUSTRALIA of October 29, 1927.

Medical Appointments.

Dr. William Arnold Conolly (B.M.A.) has been appointed Government Medical Officer at Molong, New South Wales.

* * * *

Dr. Gerald Archbold (B.M.A.) has been appointed Government Medical Officer at Woodstock, New South Wales.

* * * *

Dr. Nicol Ernest McLaren (B.M.A.) has been appointed Government Medical Officer at Port Macquarie, New South Wales.

* * * *

Dr. John Maunsell has been appointed District Medical Officer and Public Vaccinator at New Norcia and Mogumber, Western Australia.

* * * *

Dr. Oswald Joynt (B.M.A.) has been appointed Acting Medical Superintendent of the Hospital for the Insane, Sunbury, Victoria.

Dr. Allan Dunstan Lamphee (B.M.A.) has been appointed Medical Inspector of Seamen at Port Adelaide, South Australia.

* * * *

Dr. Alan Bruce Lilley and Dr. Thomas Russell Pearce (B.M.A.) have been appointed Medical Inspectors of Seamen under the provisions of the *Navigation Act*, 1912-1926.

* * * *

Dr. George Cornwall Jago (B.M.A.) has been appointed a Health Officer under the provisions of *The Healths Acts*, 1900-1922, of Queensland.

* * * *

Dr. Malcolm Leslie Scott (B.M.A.) has been appointed Acting Honorary Surgeon to the Adelaide Hospital, South Australia.

* * * *

Dr. Philip Santo Messent (B.M.A.) has been appointed Acting Honorary Assistant Surgeon to the Adelaide Hospital, South Australia.

* * * *

Dr. Harry Barnett has been appointed Medical Officer of Health for the Municipality of Bothwell, Tasmania.

* * * *

Dr. Ellen Maude Wood (B.M.A.) has been appointed Government Medical Officer at Deepwater, New South Wales.

* * * *

Dr. Thomas Robert Quinn (B.M.A.) has been appointed Government Medical Officer at Mungindi, New South Wales.

* * * *

Dr. George Elliott Hobson (B.M.A.) has been appointed a Medical Officer, Medical Branch, Department of Education, New South Wales.

* * * *

Dr. Norman A. Albiston (B.M.A.) has been appointed Public Vaccinator at Murrumbeena, Victoria.

Books Received.

A TREATISE ON HYGIENE AND PUBLIC HEALTH WITH SPECIAL REFERENCE TO THE TROPICS, by Birendra Nath Chosh, F.R.F.P. & S. (Glasgow); Revised and largely rewritten with the advice and assistance of Colonel A. B. Fry, C.I.E., D.S.O., M.D. (London), D.P.H., D.T.M. & H.; Sixth Edition; 1927. Calcutta: Scientific Publishing Company. Crown 8vo., pp. 682, with illustrations. Price: 10s. net.

Diary for the Month.

OCT. 17.—New South Wales Branch, B.M.A.: Organization and Science Committee.
OCT. 18.—Tasmanian Branch, B.M.A.: Council.
OCT. 18.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
OCT. 19.—Western Australian Branch, B.M.A.: Branch.
OCT. 21.—Eastern Suburbs Medical Association, New South Wales.
OCT. 25.—New South Wales Branch, B.M.A.: Medical Politics Committee.
OCT. 25.—Illawarra Suburbs Medical Association, New South Wales.
OCT. 26.—Victorian Branch, B.M.A.: Council.
OCT. 27.—New South Wales Branch, B.M.A.: Branch.
OCT. 27.—South Australian Branch, B.M.A.: Branch.
OCT. 28.—Queensland Branch, B.M.A.: Council.

Medical Appointments Vacant, etc.

FOR announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser," page xviii.

ALFRED HOSPITAL, MELBOURNE: Honorary Physio-Therapeutist.

COMMONWEALTH DEPARTMENT OF HEALTH: Director, Division of Maternal and Child Welfare.

INFECTIOUS DISEASES HOSPITAL, FAIRFIELD, VICTORIA: Junior Resident Medical Officer (Male).

SYDNEY HOSPITAL: Junior Pathologist.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCH.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 30 - 34, Elizabeth Street, Sydney.	Australian Natives' Association. Ashfield and District Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham Dispensary. Manchester United Oddfellows' Medical Institute, Elizabeth Street, Sydney. Marrickville United Friendly Societies' Dispensary. North Sydney United Friendly Societies. People's Prudential Benefit Society. Phœnix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane.	Members accepting appointments as medical officers of country hospitals in Queensland are advised to submit a copy of their agreement to the Council before signing. Brisbane United Friendly Society Institute. Stannary Hills Hospital.
SOUTH AUSTRALIAN: Secretary, 207, North Terrace, Adelaide.	All Contract Practice Appointments in South Australia. Booleroo Centre Medical Club.
WESTERN AUSTRALIAN: Honorary Secretary, 65, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.
NEW ZEALAND (WELLINGTON DIVISION): Honorary Secretary, Wellington.	Friendly Society Lodges, Wellington, New Zealand.

Medical practitioners are requested not to apply for appointments to positions at the Hobart General Hospital, Tasmania, without first having communicated with the Editor of THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to "The Editor," THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, Sydney. (Telephones: MW 2651-2.)

SUBSCRIPTION RATES.—Medical students and others not receiving THE MEDICAL JOURNAL OF AUSTRALIA in virtue of membership of the Branches of the British Medical Association in the Commonwealth can become subscribers to the journal by applying to the Manager or through the usual agents and booksellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. The rates are £2 for Australia and £2 5s. abroad *per annum* payable in advance.

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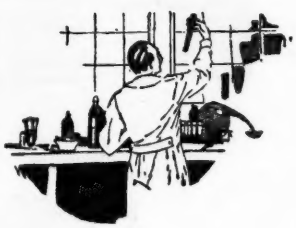

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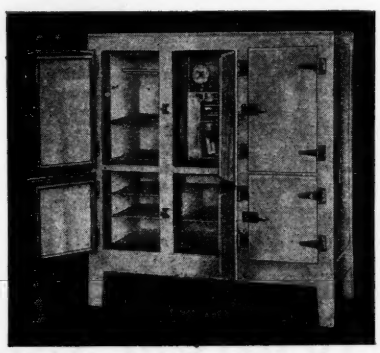

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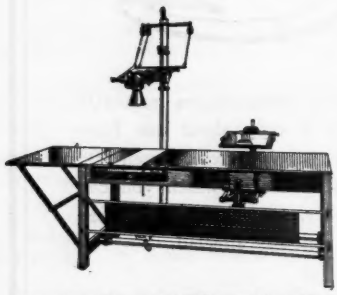

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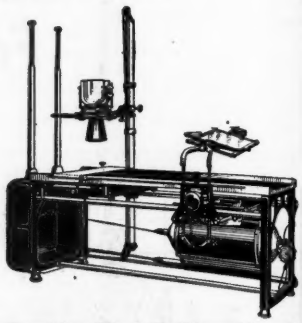

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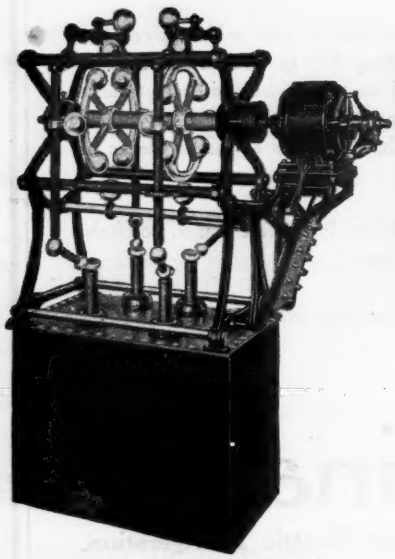

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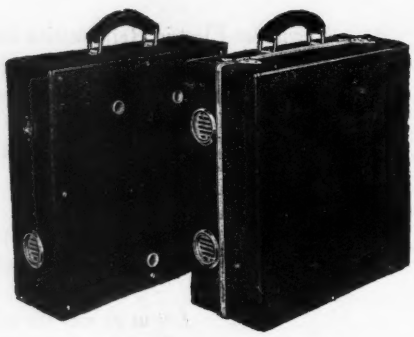

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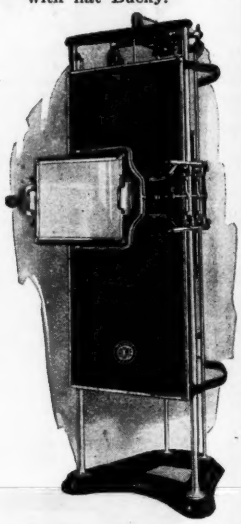

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